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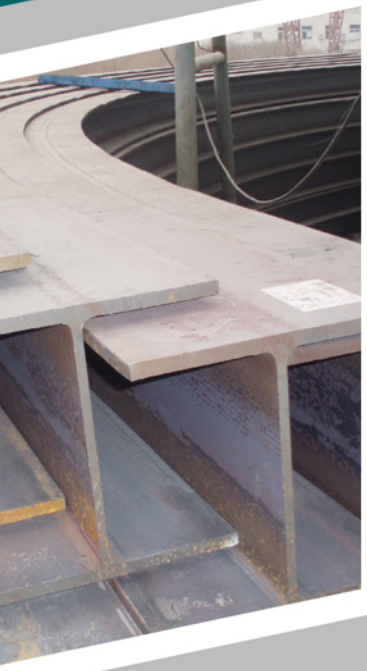

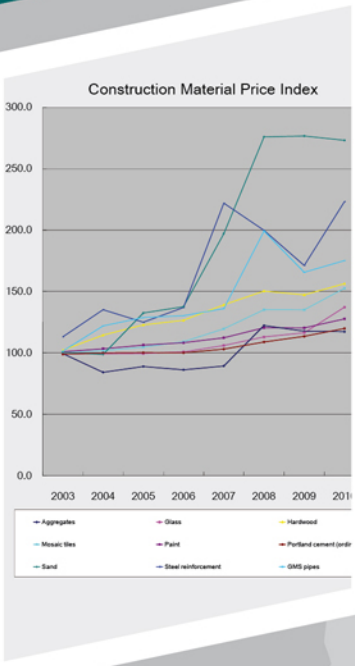

GUIDELINES ON CONTRACT PRICE FLUCTUATION SYSTEM

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Disclaimer

This publication is prepared by the Construction Industry Council (CIC) to report findings or promote good practices on specific subjects for reference by the industry. To the best of our knowledge, information contained in this publication reflects the latest legislation, policy and rules as per the date of publication. You are strongly advised to seek independent advice on any future legislation, policy and rules amendments where possible.

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Foreword

The Construction Industry Council (CIC) is committed to seeking continuous improvement in all aspects of the construction industry in Hong Kong. To achieve this aim, the CIC forms Committees, Task Forces and other forums to review specific areas of work with the intention of producing Guidelines, Codes of Practice and Codes of Conduct to assist participants in the industry to strive for excellence.

The CIC appreciates that some improvements and practices can be implemented immediately whilst others may take more time to complete the adjustment. It is for this reason that three separate categories of communication have been adopted, the purpose of which is as follows:

Guidelines	These are intended to guide industry participants to adopt new standards, methodologies or practices. The CIC strongly recommends the adoption of these Guidelines by industry stakeholders where appropriate.
Codes of Practice	The CIC expects all industry participants to adopt the recommendations set out in such Codes as soon as practicable and to adhere to such standards or procedures therein at all times.
Codes of Conduct	The CIC encourages the upholding of professionalism and integrity within the industry through self discipline. The Codes of Conduct set out the relevant principles that all industry participants are expected to follow.

The parties adopting the practices set out in this publication will normally be considered by the CIC in general as adopting good practices (where relevant) on the specific subjects. The parties using this publication should therefore seek appropriate advice from their professional advisers.

If you have attempted to follow this publication, we do urge you to share your feedback with us in order that we can further enhance them for the benefit of all concerned. On this basis the CIC Secretariat is in the process of developing a “feed-back” mechanism, whereby your views can be consolidated for such purposes. With our joint efforts, we believe our construction industry will develop further and will continue to prosper for years to come.

Purpose

This publication promotes the good practice recommended by the Construction Industry Council (CIC) for the adoption of a Contract Price Fluctuation System (CPFS) in construction contracts.

The intention of the Contract Price Fluctuation System (CPFS) is for equitable risk sharing between the employer and the contractor in terms of material, labour and/or currency cost fluctuations and seeks to rationalise the construction costs for employers over the longer term.

The application of CPFS should be designed to meet the different needs of employer organisations including Government, NGOs who rely on funding by Government through LegCo fund allocation, public bodies, as well as private sector employers.

In this publication a suite of contract price fluctuation mechanisms, ranging from simple, fair and broad-brush to more complex detailed methods have been provided as options for employers to choose according to the nature of their projects. Please refer to Section 5 for details.

The Construction Industry Council recommends that the construction industry as a whole pay heed to and consider adopting CPFS as good practice. The extent and the type of CPFS used should be evaluated by individual employer organisations following the general principle of equitable risk sharing between the employer and the contractor.

Terminology

In this document, unless the context otherwise requires:

1. “AE” Adjustable Element
2. “BS” Building Services
3. “CENSTATD” Hong Kong Census and Statistics Department
4. “CIC” Construction Industry Council, Hong Kong
5. “CP” Calculated Proportion
6. “CPF” Contract Price Fluctuation
7. “CPFS” Contract Price Fluctuation System
8. “CPI” Consumer Price Index
9. “Com-PCM” Committee on Procurement
10. “DEVB” Development Bureau
11. “E&M” Electrical and Mechanical
12. “ETWB TCW” Environment, Transport and Works Bureau Technical Circular (Works)
13. “EV” Effective Value
14. “FIDIC” International Federation of Consulting Engineers
15. “HA” Housing Authority
16. “HIA” Housing Industry Association
17. “HKCA” Hong Kong Construction Association
18. “HKSAR” Hong Kong Special Administration Region
19. “ICE” Institution of Civil Engineers
20. “LME” London Metal Exchange
21. “MTRCL” MTR Corporation Limited
22. “NGO” Non-Governmental Organization
23. “NSC” Nominated Sub-Contractor
24. “PFF” Price Fluctuation Factor
25. “RLB” Rider Levett Bucknall
26. “SoP” Schedule of Proportions
27. “SoR” Schedule of Rates

Definitions

Term	Definition
Adjustable Elements	The elements in the contract sum which are identified as subject to possible fluctuation in price
Base Index Figure	The value of the price index of a particular Adjustable Element in the base month as specified by the employer in the contract
CAP Approach	An extension of the Risk Proportion Approach whereby a ceiling is applied to the risk of price fluctuations beyond which the risk will be borne solely by one party
Combined Price Fluctuation Factor	The sum of the Price Fluctuation Factors for all of the Adjustable Elements that will be applied to the Effective Value for a particular valuation period
Contract Price Fluctuation System (CPFS)	A mechanism included in a construction contract between the employer and the contractor that compensates for the risk of fluctuation in the price of certain predetermined elements of the contract in a pre-agreed calculation method
Current Index Figure	The value of the price index of a particular Adjustable Element in the prevailing valuation period
Effective Value	The value of the work done in a particular valuation period, excluding any value of work and material based on actual cost or current prices
Fluctuation Adjustment	The amount that is calculated under the CPFS for a valuation period and that will be payable/deductible from the total amount due to the contractor in the interim payment certificate for that valuation period
Non-Adjustable Elements	The elements in the contract sum which are identified as not subject to reimbursable fluctuation in price
PFF Approach	An option where the Price Fluctuation Factors for each Adjustable Element in the contract are combined to form the Combined Price Fluctuation Factor which will in turn be applied to the Effective Value of the work in a valuation period to arrive at the Fluctuation Adjustment
Price Fluctuation Factor	A value calculated by multiplying the proportion of an individual Adjustable Element by the percentage change in the Current Index Figure when compared with the Base Index Figure

Term	Definition
Risk Proportion Approach	An option where the risk of price fluctuation of the contract sum is shared in a pre-agreed ratio between the employer and the contractor
Schedule of Proportions	A schedule designed for the PFF Approach for the computation of the Combined Price Fluctuation Factor
Specified elements	Terminology used for the Adjustable Elements for Target Cost contracts
Target Cost Approach	An option where Specified elements, together with their planned consumption and estimated unit price, are identified in the tendering period and where each Specified Element may be adjusted by the difference between the weighted average of the actual prices paid for the Specified Element and the estimated unit price at tender of the Specified Element

1. Background

1.1 Who is in the best position to deal with price fluctuations?

The low volume of construction works after the peak in 1997 resulted in highly competitive tender prices and low profit margins. Coupled with the unprecedented escalation of fuel and building materials costs since 2008, the risk of price fluctuations has become more critical to construction works contracts for both the contractor and employer. Considerable variation in costs may occur due to the time lapse between quotation, acceptance of tender and the commencement of works. The risk is mainly in the volatility of costs of materials and labour. Both contractors and employers can benefit from a system for CPF.

Significant costs fluctuation may lead to under or over estimation of tender costs and both parties may be exposed to unexpected risk at different times in the business cycle.

CPF provisions may assist in the improvement in quality, delivery and sustainability of projects and may promote more harmonious working relationships due to a more equitable system for sharing risk. CPF provisions may also avoid the incorporation of unnecessary additional premium costs in contractors' bids for fixed price contracts. It may also enable contractors to focus on their core construction operations without being distracted by undesirable cost-cutting measures to compensate for unexpected increases in costs of labour and basic construction materials.

In late 2008, taking note of the successful experiences of Government, the Com-PCM concurred that CPFS could be a mechanism for promoting fair and equitable risk-sharing for all industry stakeholders. Thus, a Task Force was set up to study this issue and if appropriate to prepare guidelines to promote the implementation of CPFS in construction contracts.

It is believed that the application of CPFS will benefit both employers and their appointed contractors.

1.2 Terms of reference

The Com-PCM under the CIC was established to examine the current practices in procurement and to recommend good practices for improving quality and cost-effectiveness in the delivery of construction projects.

Towards the end of 2008, members of the Com-PCM agreed that promotion of the extended adoption of CPFS would help in fostering a fairer and more equitable risk-sharing work environment and contribute to the healthy development of the industry as a whole. In view of the considerable amount of fact-finding and reviewing (of experience) that would be required in the process, the Com-PCM decided to form a Task Force to coordinate and undertake the drafting of the Guidelines on Contract Price Fluctuation System for Construction Contracts. Members of the Task Force, comprising relevant stakeholders in the construction

industry, have contributed their knowledge and expertise in the preparation of these guidelines.

The key terms of reference for the CIC Task Force on Contract Price Fluctuation System are as listed below:

1. To review the experience of applying CPFS in housing projects and public works, as well as the latest development of CPFS by MTRCL;

2. To deliberate and consider issuing guidelines on CPFS;

3. To undertake the drafting of the Guidelines, if agreed to be issued, and to formulate plans for promulgating the adoption of CPFS by the construction industry.

2. Purpose and application of the Contract Price Fluctuation System

2.1 What is the Contract Price Fluctuation System (CPFS)?

The objective of CPFS is to promote fair risk sharing between the employer and the contractor. CPFS is considered an equitable risk-sharing mechanism, as payments to the contractor can be adjusted either upwards or downwards in response to actual changes in costs of labour and selected key materials during the course of the contract. With CPF provisions, the contractor is made aware at the time of tender that the contract will be subject to CPFS. This awareness helps to remove the uncertainty of inflation/deflation and hence the contractor can price his tender based on the current market value without including an additional premium to take account of possible movement. At the same time, CPFS ensures the employer pays what should be paid, taking into account prevailing inflation or deflation.

CPFS is widely used in the government's public works contracts with conditions as specified in ETWB TCW No. 21/2003. Advantages observed in having tender assessments and contract awards based upon current market value, with future fluctuations provided for using an index and formula approach, include lower risk premium, better quality and timely delivery.

Depending on the scale and nature of projects, similar benefits may be realized by all employers. In this regard, the Task Force has consolidated useful CPFS principles applicable to Hong Kong with reference to the experience of CPFS application by HA and DEVB as well as the latest development of CPFS by MTRCL. Comments and suggestions from relevant industry stakeholders have been essential in the development of practical guidelines.

CPFS is intended to reduce the pricing risk for contractors in terms of labour, materials and indirectly currency, and may reduce construction costs for employers in the long run. Benefit from CPFS in public works projects by relieving contractors of the need to price contingencies for price fluctuation has also been observed. Similar benefit should be realised by all employers.

2.2 Application of CPFS by the Public Sector

The CPFS adopted for public works contracts in Hong Kong is a risk management mechanism for sharing construction costs risk between Government (as the employer) and contractors. Construction contract payments are adjusted upwards or downwards according to changes in the index numbers for the labour and materials costs compiled monthly by the Census and Statistics Department.

The ETWB TCW No. 21/2003 provides directive guidelines on the application of CPFS to Government's works tenders with contract duration of over 21 months. Interim or final payments to contractors are increased or decreased based on a price fluctuation factor (PFF) on account of changes in the index numbers for the costs of labour and materials used provided monthly by the Census & Statistics Department. In the wake of volatile construction material prices, DEVB decided to apply CPFS to all new government capital works tenders invited from July 2008

onwards regardless of the duration of the contract period, unless there are genuine practical problems such as for contracts involving predominant use of proprietary products/systems or where there are no relevant cost indices for price fluctuation computation.

HA also adopts the CPFS in their new works and maintenance works contracts. The CPFS in HA's building and civil engineering works contracts are similar to that stipulated in ETWB TCW No. 21/2003 except that the SoP is tailor-made to suit the major constituent materials of HA contracts whereas the CPFS in HA's foundation contracts, nominated sub-contracts and maintenance works contracts are modified systems suiting particular contract characteristics.

2.3 Application of CPFS by the Private Sector

CPF provisions in private sector contracts assist the delivery and sustainability of projects as well as limiting contractors' risk of construction costs increase. CPFS helps to avoid the inclusion of excessive premiums in contractors' bids for fixed price contracts.

According to the Quarterly Hong Kong Construction Cost Report – December 2010 prepared by RLB, formerly known as Levett & Bailey, the building tender price indices for both private sector and public sector had been rising since the first quarter of 2005 (except for the period late 2008-2009). Inflation rates in Mainland China and Hong Kong, high materials costs, shortage of labour in Hong Kong (due to the construction boom in Macau and countries elsewhere in Asia) were the major factors contributing to the increase in tender price indices. RLB anticipates that the year 2011 will see further rises in tender prices as the US dollar maintains its weak position and the renminbi continues to appreciate.

Costs escalation due to fluctuation may exceed the general limits of contingency provided for a development and may have serious impact on budgets, project financing plans and the overall financial feasibility of a development. The tender amount for a works contract may turn out to be overestimated or underestimated and both the contractor and the employer may be exposed to risks of different natures. It is currently common practice that a contractor is not entitled to any increase in the contract price when its materials and labour costs increase; and an employer is not entitled to a reduction in the contract price when such costs decrease. However, for contracts with CPFS, the risks associated with price/cost fluctuation are better managed if not fully removed.

2.4 Possible Arrangements for Applying CPFS in Private Sector Works Contracts

In order to achieve the intended objective of mitigating cost inflation risk, it is recommended that construction contracts include a clause for CPF, which should set out clearly the adjustment mechanism for increases or decreases due to price fluctuations.

To ensure the effective operation of CPFS in private sector works contracts, contractors and employers should –

2. Purpose and application of the Contract Price Fluctuation System

1. Monitor the movements of material and labour costs carefully to enable accurate estimation of their costs for the purpose of tendering. A reference list of the construction inflation reference documents could be made available for private sector works projects (Reference could be made to the Average Wholesale Prices of Selected Building Materials published monthly by the Census and Statistics Department);

2. Collect feedback and refine, update and improve the CPFS in tendering and works documents to ensure efficient operation and development of the system.

3. Experience in the Application of CPFS

3.1 Local Experience

3.1.1 Public Works

CPFS was first introduced in 1976 in government civil engineering contracts with contract duration exceeding 12 months. The system was subsequently extended to building contracts in 1977. In 1995, the threshold for CPFS was raised from 12 months to 21 months in order to make greater use of fixed-price contracts so as to achieve tighter budgetary control.

With contract price fluctuation provision, the contractor is aware at the time of tender that the contract will be subject to CPFS from the outset. This helps to reduce speculation by the contractor for uncertainty in material and labour cost movement. Hence, the contractor can price his tender based on material and labour costs as at the date pre-fixed in the tender document. At the same time, CPFS allows Government to pay or be reimbursed the amount of fluctuation. Without CPF provision, the contractor bears the whole risk of material and labour cost fluctuation, and to mitigate his risk the contractor may include an additional premium in his bid. Contractors prefer clear commitment by Employers regarding CPFS in tenders.

Under the CPFS, contractors are required to spell out the relative proportions of labour and materials to be used in the works by completing a Schedule of Proportions which is submitted together with their tender bids.

The 21-month threshold introduced in 1995 was against a background of high construction output, with the Airport Core Programme works in full swing. Government's main concern at that time was to make greater use of fixed-price contracts so as to improve budgetary control. With the use of various subsequently developed measures to strengthen project financial management, the need to use fixed-price contracts to ensure budgetary control diminished. In addition, most of the contracts of less than 21 months duration were awarded to small and medium-sized contractors. Being less capable of mitigating inflationary risks, these contractors are particularly exposed to such risks and yet they were working mostly on contracts without contract price fluctuation provision. Therefore, the HKSAR decided that from July 2008 onwards all government capital works contracts could incorporate the CPFS provision regardless of contract duration unless there were genuine practical problems such as for contracts involving predominant use of proprietary products/systems and there are no relevant cost indices for price fluctuation computation.

Other than capital works contracts, CPFS is also adopted by works departments in building and civil engineering works term contracts. Unlike capital works contracts, payment for contract price fluctuation is usually adjusted once only upon issue of the work order.

HA also adopts the CPFS in their new works and maintenance works contracts. From December 2008, HA extended the application of CPFS to all new works

and maintenance works contracts irrespective of duration except for a few contract types[1].

A fluctuation clause that stipulates how the payments to the contractor should be adjusted in accordance with the CPFS is included in the General Conditions of Contract (GCC) for different types of public sector construction contracts (civil, building, E&M, design and build, term contracts etc).

The wordings of the fluctuation clause stipulated in Government's standard GCC for the civil, building and design and build contracts are the same. However, in the GCC for E&M contracts it is expressly stipulated that fluctuation adjustment is not applicable. For term contracts, only civil engineering works term contract contains the fluctuation clause. The following table summarises the standard GCC being used by the Government for different types of construction works and the applicability of the fluctuation clause:

Type of Contract	Document	Fluctuation Clause applicable?
Civil Engineering Works	General Conditions of Contract for Civil Engineering Works 1999 Edition	Yes (included as Clause 89)
	General Conditions of Contract for Term Contracts for Civil Engineering Works, 2002 Edition	Yes (included as Clause 92)
E&M Engineering Works	General Conditions of Contract for E & M Engineering Works, 1999 Edition	No (expressly stipulated in Clause 89)
	General Conditions of Contract for Term Contracts for Electrical And Mechanical Engineering Works (2007 Edition)	No
Building Works	General Conditions of Contract for Building Works, 1999 Edition	Yes (included as Clause 89)
	General Conditions of Contract for Term Contract for Building Works (2004 Edition)	No
Design and Build Contract	General Conditions of Contract for Design and Build Contract 1999 Edition	Yes (included as Clause 89)

3.1.2 Utility Works

In general, China Light and Power Ltd (CLP) adopts a flexible approach to allocating and managing the risk. While there is a preference for shifting risk to capable contractors, the actual risk allocation will be negotiable and will depend on the extent of uncertainties of the project and the contractors ability to assess and manage the risks.

1. Risk-Sharing Proportion

[1] Exceptions:-

(a) Foundation contracts with contract period not exceeding 12 months;
(b) Nominated sub-contracts for lift installations;
(c) Demolition, soft landscape and term contracts (other than ground investigation term contracts with contract period exceeding 12 months);
(d) Lift modernization contracts and nominated sub-contracts for addition of lifts;
(e) Small scale lump sum maintenance contracts; and
(f) Ad hoc contracts for which it is considered impractical, undesirable or not meritorious to apply CPFS due to reasons such as small value, short duration, predominant use of proprietary products/systems and/or the lack of suitable cost indices for CPF computation.

For firm project requirements where normally the scope is clearly defined and the contractor is given reasonable time and information to assess the risks, a fixed lump sum approach is adopted as far as practical, with the contractor bearing most of the risk. There are also successful applications of target cost, with a 50/50 pain/gain-sharing mechanism, to managing projects with higher risks and uncertainties.

For framework agreements, there is more even risk sharing between contractor and employer. Price fluctuation for major materials is normally allowed, with the risks commonly borne by the employer. The risk of labour cost fluctuation can be borne by either contractor or employer, depending on the willingness of contractors to take on the risk. With the relatively slower pace of change in the price of labour when compared with other factors of production, contractors are more willing to manage such risk.

2. Pain/Gain-Sharing Mechanism

Pain/gain sharing, based on mutually agreed target cost, provides an incentive for both contractor and employer to work together for mutual benefit. It is deployed for specific contracts having:

- firm project requirements with higher risks and uncertainties, and can be with or without a price cap; or
- operation and maintenance framework agreements with open book approach to explore innovative means to reduce cost.

Proportion of pain/gain sharing is commonly 50/50, and may have a cap on pain share, especially for framework agreements where the risks are more uncertain. Execution of pain/gain-sharing principles requires:

- well-defined project objectives;
- greater freedom for contractors to innovate; and
- collaboration at all levels.

3. Reference Indices for Price Adjustment

Commonly recognised indices are to be applied. Examples are:

- London Metal Exchange for metals
- Construction Cost Index from Highways Department
- Consumer Price Index or any specified index
- Material and labour costs from Census and Statistics Department

4. Frequency of Adjustment

Framework agreements normally have firm prices for the first two years and annual price adjustment for subsequent years. Where the cost of a product is highly dependent on commodity prices, such as copper cable for E&M works, monthly contract price adjustment with monthly orders is practised.

5. Effective Date of Adjustment

For small works, unit rates are effective for ordering any time during the year. For large building works, the adjustment is normally 3 months before site work commences.

6. Requirement for Proof / Evidence of Risk Exposure to Claim Adjustment Entitlement

Adjustment is normally based on contractor submission of Bills of Quantities and assessed / approved by the employer's Quantity Surveyor.

7. Mechanism of Currency Movement

Contractors are normally capable of accepting HK$- or US$-denominated contracts. Where a contractor submits a more attractive alternative currency offer, the employer will take on the forex-management risk.

8. Other Comments

Experience shows that contractors value demand forecasts highly, even if there is no guarantee of accuracy, for their forward planning and risk management.

It should be acknowledged that while CPFS is intended to help contractors to manage their risk in a prudent manner, individual risk-taking contractors may bet on the timing of firming their material contracts and / or put forward unrealistic unit rates that could benefit them based on their own forecasts of demand and price trends.

3.1.3 Railway Works

1. Background

Prior to 2009, MTRCL had not awarded any contracts on a fluctuating basis; all contracts were awarded on a lump sum fixed-price, notwithstanding that a contract price adjustment mechanism has been available since 1991. Certain contracts were awarded in foreign currencies and the price adjustment factor was based on the exchange rate of the currency or currencies in which the contract sum was denominated.

The surge in material costs in 2007 and 2008, and the construction industry alerted MTRCL to the need for a degree of escalation protection for contractors. Consensus on the necessity to provide for CPFS in construction contracts was reached and MTRCL decided to adopt CPFS in civil, E&M and BS contracts.

2. General Principle

The general principle is to oblige tenderers to submit tenders that include two offers – one with CPFS and one on a lump-sum fixed price basis. The submitted tenders will then be assessed and the contract awarded to the most favourable tenderer in accordance with the assessment criteria. Only the CPFS offer or the lump sum fixed-price offer of the successful tenderer will be accepted. The decision will depend on which one is more favourable to MTRCL in projected outturn monetary terms. For contracts of a shorter duration, i.e. less than 24 months, or those of a specialist nature, the lump sum fixed-price model is preferred.

Currently, MTRCL adopts a variety of fluctuation mechanisms in accordance with the type of construction contracts awarded:

- Target Cost contracts
- Civil and Building contracts
- Building Services and System-wide E&M contracts

3. Target Cost Contracts

Under the target cost system, the contract will be formed via a two-stage process. At Stage 1, a tenderer will be invited to identify those elements of the tender (Specified elements) that are regarded as "price volatile" and which the tenderer wishes to be adjustable in the Target Cost. The tenderer is required to identify the planned quantity of the Specified elements in the tender. If agreed by MTRCL, and after the contract is awarded the price of the Specified elements will fluctuate according to the difference between the actual price and the estimated price in the contract multiplied by the planned quantity. All costs other than the Specified elements will remain fixed for the contract duration.

4. Civil and Building Contracts

A CPFS similar to that of HA and DEVB is currently used for the civil and building contracts. The tenderer is allowed to assign weightings (bound by lower and upper constraints) to labour and selected materials under the contract, from which the "Calculated Proportion (CP)" for each item is calculated. The PFF is then calculated by multiplying the CP by the percentage change in the associated index for that item. By summing up the PFFs for all the items, the combined PFF is obtained and will be applied to the Effective Value of the Works for that valuation period.

5. Building Services and System-wide E&M Contracts

Unlike the civil or building contracts, elements of the BS and E&M contracts are generally classified into three groups, i.e. Preliminaries, Materials and Labour, with each group having its own adjustment mechanism, although no fluctuation is currently allowed for the Preliminaries group. For the Materials group, the tenderer is allowed to insert a percentage (subject to lower and upper constraints) for each of

the items inside that group to denote the proportion of that item that is subject to fluctuation. The same mechanism is applied to the Labour group, except that it may be subject to different lower and upper constraints. The total of the inserted percentages of the three groups must total 100%. The PFF will then be calculated in a way similar to that for the Civil and Building contracts, based on the governing indices. The major difference between the Materials and Labour groups is that the Materials group items will fluctuate only once at a specific time in the contract period, whereas the Labour group items will fluctuate on a monthly basis during a pre-defined installation period.

6. Summary

Despite different fluctuation mechanisms being used for the various types of contracts, the ultimate objective is to provide the contractor a means to mitigate risks due to movement in labour and material prices during the contract period. That said, it is not intended to offer opportunities to exploit the mechanism by speculating on the future movement of the indices. In order to prevent this, not the entire contract sum is subject to fluctuation. Percentage constraints are also imposed on different groups of items classified according to their nature (e.g. preliminaries, materials, labour) so that the chance of overstating the fluctuating proportion of any item is minimised and the PFF so calculated is reasonable and realistic. The requirement for tenderers to submit one offer with CPFS and another with lump sum fixed-price gives MTRCL the flexibility to accept a package that is most cost effective while fulfilling the commitment to incorporate price fluctuation measures in tendering.

3.2 Overseas Experience in the Application of CPFS

Price escalation is a worldwide problem; when the price of a certain material rises in one region of the world it may soon spread elsewhere. Having said that, the methods of dealing with fluctuations vary from region to region, and even within a country there may be different ways the issue is dealt with. The solution depends on the intentions of the contracting parties, whether there are any guidelines in place or if legislation imposed by Government.

Though different provisions are stipulated in the various standard conditions of contract used around the world, the general principle is still the same – to minimise the risk of the contractor due to the unforeseeable price escalation of construction materials, and for the employer to obtain the most competitive tender price. The way such provisions or guidelines are applied may differ from one jurisdiction to another. For example:

3.2.1 Conditions which may have to be satisfied before CPFS applies

This refers to the triggering elements for CPFS, one of which may be the minimum percentage by which a certain material has to fluctuate from its base price before CPFS is applied. The setting of such a minimum percentage depends wholly on the agreement between the contracting parties and can range between 1.5% and 15%. This can also be dealt with

by the introduction of a percentage that is not subject to fluctuations, i.e. a Non-Adjustable Element. Other conditions may include the duration of the contract, the contract amount and the discipline of the works. It is quite common that the fluctuation clause would not be applicable for contracts of a short duration or of a small contract sum. E&M contracts are also less likely to have CPFS than their civil and building services counterparts.

3.2.2 Effective date of CPFS

This is the date when the first fluctuation adjustment is effected in the interim payment certification. Some contracts may specify, say, one year from the commencement of contract, while others may specify the date when certain event/milestone occurs. Fluctuation may occur on a regular, intermittent or "one-time" basis.

3.2.3 Base date of cost indices

This refers to the base date (or month) of the materials/labour cost indices relevant to the CPFS.

3.2.4 Frequency of fluctuation adjustment

This refers to whether the fluctuation is a one-off or a recurring adjustment throughout the contract period.

It is not feasible to compare on a country by country basis, as no single country has a universal CPFS that all employers and contractors follow. However, the following provides an overview of the practice in dealing with construction price fluctuations in other countries. In the following sections we will review the situation in four major markets, namely China, United Kingdom, Australia and Japan.

1. China

In China, it is uncommon to find a contract price fluctuation clause in construction contracts. In fact, some contracts explicitly stipulate that the contractor has to bear the risk of price escalation within their tender price. However, that approach has led to unexpected results. Contractors submit unrealistically high tender prices to absorb the risk; or they submit a qualified tender seeking removal of the restricting clause(s); or they accept the restraint and raise their price fluctuation claims during the construction stage, leading to protracted negotiations or litigation.

Due to the general price escalation of materials in 2007 & 2008, municipal governments in China issued recommendations to the employers and contractors in the Mainland on handling the price fluctuations issue. The level of detail in these recommendations varied considerably. Some expressly listed the formulae for calculating the price adjustments (e.g. those issued by the Shenzhen Construction Bureau), while some merely stated the conditions that justify price adjustment and expected employers and contractors to negotiate and

resolve the issue. Notwithstanding, the general direction was the same – asking employers and contractors to agree to a mechanism for tackling price fluctuations. Mainland employers have adapted to this approach and are incorporating fluctuation mechanisms in their contracts. A Hong Kong developer who has property development works in China advised that in 2009 they agreed with their contractors on projects in Chengdu that should the price fluctuation exceed ±15%, based on the market price indices published by the Chinese government, then the interim payment will be adjusted in accordance with the price difference using a preset formula which takes into account the price indices at the time the works are carried out and the indices at the base date.

2. United Kingdom

Conditions of Contract commonly used in the UK include either FIDIC or ICE. Both these sets of conditions include a clause to allow for price fluctuation adjustment. The ICE Conditions of Contract (6th edition) includes the mechanism for calculating the price fluctuation factor, which is applied to the Effective Value of the interim payment to obtain the fluctuation adjustment. This is in line with the practice of HA, and DEVB and MTRCL civil contracts in Hong Kong. The FIDIC Conditions of Contract for Works of Civil Engineering Construction (the "Red Book") also have guidelines for drafting the fluctuation clause(s), whereas the FIDIC Conditions of Contract for E&M Works (the "Yellow Book") leaves the fluctuation calculation to be agreed between the employer and the contractor and when agreed to be stated in the Preamble.

3. Australia

One of the standard forms of contract used in Australia, which has provisions for fluctuations, is known as the "HIA (Housing Industry Association) Standard Cost Plus Contract". It is used mainly by employers who are constructing personal domestic houses. This form is designed for small works and would not necessarily be applicable for major infrastructure works. Different states in Australia have varying legislation on whether cost plus contracts are allowed or whether fluctuation clauses are allowed. For instance, in New South Wales the fluctuation clause is allowed, whereas in Victoria it is currently illegal unless the contract is more than AUD0.5M.

4. Japan

In Japan, the standard form of contract is known as "建設工事請負契約書" (Form of Contract for Construction Works). The form of contract includes a provision for the treatment of material price fluctuations, with a base date of cost indices (date of signing of contract), the effective date of fluctuation (1 year after signing of contract) and a minimum fluctuation rate (1.5%) clearly stipulated. However, it leaves the base indices to be mutually agreed between the employer and the contractor and then to be included in the Contract Agreement. In case agreement

is not reached within 14 days of signing the contract, the employer can decide unilaterally and subsequently inform the contractor.

3.3 Summary

This brief overview of the practice of fluctuation adjustment in four other countries, confirms that there is no single fluctuation formula that suits all jurisdictions, nor a single formula to satisfy all employers and contractors. What can be observed is that there is a desire in the construction industries of all of these countries to address the issue of price fluctuation and to assist contractors in mitigating the risk of unforeseeable escalation in materials and labour prices. This intention is reflected in the standard form of contract or the recommendations/guidelines issued by various local or national governments.

Another option is to leave it to the contracting parties to agree a mechanism, but of course if there is an available set of guidelines that has been established by an authoritative body in the construction industry then it will save both parties time and effort in formulating the mechanism and will also avoid the risk of dispute over the fairness of the mechanism, as such guidelines are usually established after balancing the risks of both contracting parties.

4. Pros and Cons of adopting CPFS

4.1 Advantages

The advantages of adopting CPFS are:

4.1.1 For the employer

1. Encourages competitive tenders by releasing contractors from the need to include speculative pricing for fluctuations in tender bids;

2. Avoids potential works interruptions/terminations due to financial difficulties of contractors associated with increases in construction costs;

3. Reduces the risk of substandard works due to the use of poor quality or insufficient materials or labour force due to unexpected cost pressure;

4. Minimizes the possibility of sacrificing quality and safety due to significant cost-cutting measures in an inflationary economy and avoids any extra expenses arising from efforts in investigation, administration work, loss of man-hours in case of injuries, loss of lives in serious accidents as well as the consequential compensation;

5. Benefits from reduced construction costs in a deflationary economy;

6. Rationalizes building costs in the long run due to decreased risks; and

7. Enhances a harmonious and cooperative working environment between employers and contractors and reduces the risk of commercial disputes.

4.1.2 For the contractor

1. Avoids loss of competitiveness due to overstated tender amounts to provide for construction costs increases;

2. Lowers risk of financial loss/insolvency due to understated tender amounts or unforeseeable inflation in costs where actual construction costs cannot be recovered from employer's payments;

3. Ensures compensation by employers for the relevant portion of any increased amount of construction costs in an inflationary economy; and

4. Reduces the scope for commercial disputes.

4.2 Disadvantages

The disadvantages of adopting CPFS are:

1. May require a more detailed payment application process requiring more resources and therefore greater cost to manage;
2. May encourage contractors to speculate on fluctuation compensation;
3. May Introduce an additional variable for the assessment of tender prices.
4. May create uncertainty in estimating individual project cost;
5. May appear to increase construction costs in an inflationary economy;
6. The benefits of a fluctuation compensation method may not get passed to lower tiers of subcontractors.

5. CPFS Options

5.1 Introduction

CPFS offers a method of risk apportionment, control and management. If the employer believes that there is a risk of price fluctuations for labour, materials and equipment during the construction phase of his project and that risk may adversely affect cash flow, profit and loss account and consequently the performance of his contractor, then it is recommended that he adopts CPFS in the contract.

There are a variety of methods the employer can adopt. The different approaches suggested in these Guidelines include Risk Proportion, CAP, Target Cost and PFF. Each of these will be discussed in detail under Section 5.2. These options are not exhaustive, but represent examples of the most common ways currently practised in handling price fluctuation risks in the construction industry. In determining which approach to use, the employer should consider factors such as the nature and risks of the construction contract, the term of the contract, the risk management capability of the contractor and not least the value of the contract, as for low-value or short-term contracts it may be viewed that there is no necessity for CPFS.

It should be noted that there is no universal rule as to which approach should be adopted. The employer should choose the one which he believes is most suitable, following the principle that it should be effective, straightforward, practical and easy to understand for both the employer and the contractor.

The employer should also consider the level of risk that he is willing to absorb or to share with the contractor. Again there are no strict rules for determining the risk sharing proportions. The suggestions provided in these Guidelines are based on the general practice adopted in the construction industry. The employer should note that he is free to adjust the proportions to a level he thinks fit and reasonable in the circumstances applicable to his contract.

The employer may refer to the guidelines shown on the following page to select the approach that best suits his contracts.

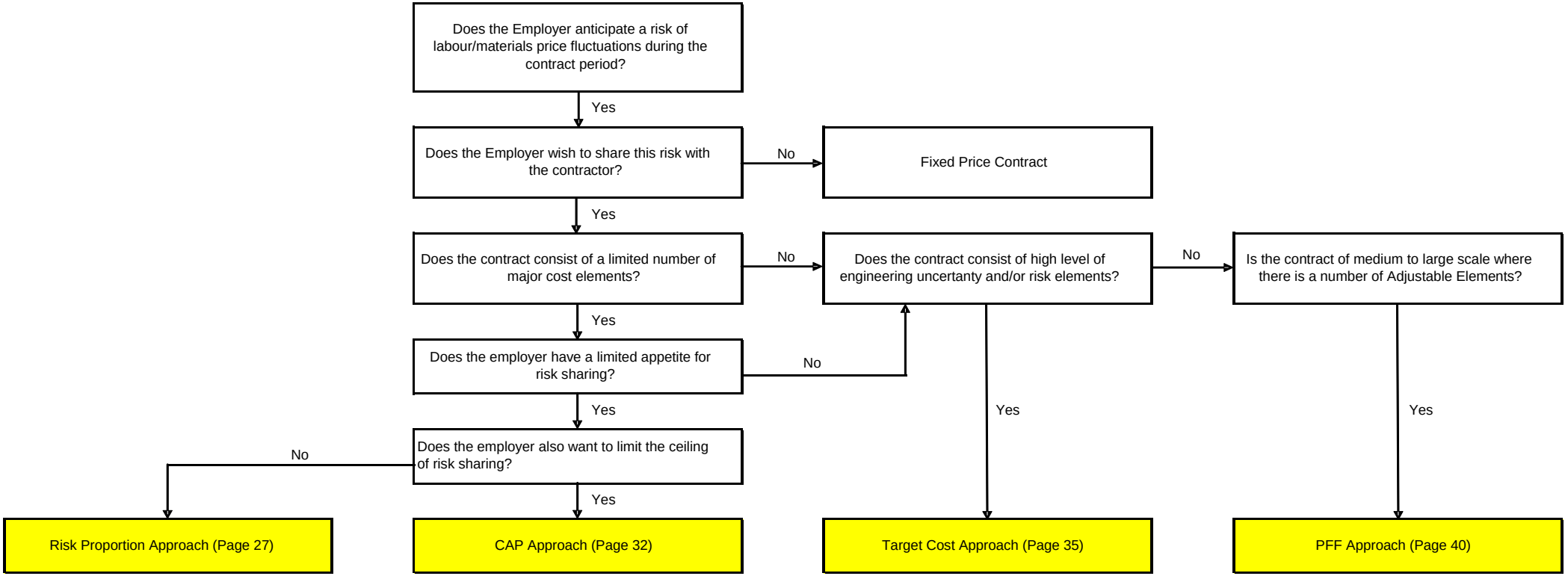

Figure 1 Guidelines on the choice of CPFS Options

5.2 Possible Approaches

5.2.1 Risk Proportion Approach

The Risk Proportion Approach represents the most simple and straightforward way to deal with the price fluctuation risk.

The contract sum can be viewed as comprising two parts: one part composed of elements that are more prone to major price fluctuations (the “Adjustable Elements”) and the other part made up of elements that are less prone to fluctuations (the “Non-Adjustable Elements”). Adjustable Elements generally include materials, equipment and labour; whereas Non-Adjustable Elements are more commonly costs such as preliminaries insurance, project management costs, design costs, contractor’s site office and other fixed overheads.

As each Adjustable Element can have its own set of indices which track price movement, the employer and the contractor can agree on different indices for different Adjustable Elements. However, it should be noted that when the number of Adjustable Elements increases, so will the number of indices to be tracked; and this will increase the complexity of the fluctuation adjustment calculation. A simpler method is to adopt a composite index to track all of the Adjustable Elements.

One such available index is the Consumer Price Index (CPI). Although the CPI is not designed for the construction industry it is nevertheless an indicative index for measuring inflation on a general scale. An alternative to the CPI is the Producer Price Index, which is also published by the Hong Kong Census and Statistics Department, but on a quarterly basis.

Under the Risk Proportion Approach, the employer will mandate the proportion of the Non-Adjustable Elements in the contract. This proportion can vary among contract disciplines. For example, the usual proportion of Non-Adjustable Elements for a civil construction contract is 15%, whereas for an E&M contract it can be 40% or higher.

Once the proportion of Non-Adjustable Elements is set, the employer can decide the minimum level of price fluctuation above which the risk-sharing mechanism becomes effective. As an example, the employer can stipulate that the first ±15% of price changes will not be subject to fluctuation adjustment. Accordingly, if the price fluctuates by 10%, no adjustment will be effected. If the price fluctuates by, say, +18%, the first 15% will not fluctuate but the next 3% will be adjusted according to the agreed risk-sharing mechanism.

The next step is for the employer to mandate, or to agree with the contractor, the ratio of risk sharing associated with fluctuation in prices (the “Risk Sharing Ratio”). The Risk Sharing Ratio can be 100:0 50:50, 40:60 or any other ratio that is agreed as just, appropriate and acceptable.

The Risk Proportion Approach is suitable for contracts which have fewer major cost elements and where the Employer has a limited appetite for risk sharing. Because of its simplicity and ease of application, it can be applied to all types of contract including civil, building and E&M.

Please refer to Worked Examples 1.1 to 1.3 on the following pages for demonstrations of this approach.

A sample of the fluctuation clause is shown in Appendix A1.

Worked Example 1.1

Worked Examples 1 - Risk Proportion Approach

Calculation of Fluctuation Adjustment

1.1 - SCENARIO A - Change in index below minimum threshold				
Proportion of Non-Adjustable Elements	40%			
Minimum threshold of Fluctuation	±15%			
Risk-Sharing Ratio (employer:contractor)	50:50			
	Base Month	Current Month	% Change	Applicable for Fluctuation Adjustment?
CPI (or any specified index)	100	110	10%	No
Calculation of Fluctuation Adjustment				
Total Value of Work Done to Date (before adjustment for fluctuation)		10,000,000		
Less: Total Value of Work Done up to last valuation period (before adjustment for fluctuation)		8,000,000		
Value of Work Done in this period		2,000,000		
Deduct portion of Non-Adjustable Elements				
40% x HK$2,000,000		800,000		
Value of Work Done adjustable for fluctuation		1,200,000		
Net change of CPI (or any specified index) above threshold				
10.0% - 15.0% = -5.0% < 0		0%		
Fluctuation Amount for this period		-		
Risk-Sharing Proportion borne by contractor		-		
Net Fluctuation Adjustment payable for this period		-		

Note: Since the % change in the CPI is less than the minimum threshold of fluctuation, no adjustment will be applied

Risk Proportion Approach
Calculation of Fluctuation Adjustment

1.2 - SCENARIO B - Change in index above minimum threshold				
Proportion of Non-Adjustable Elements	40%			
Minimum threshold of Fluctuation	±15%			
Risk-Sharing Ratio (employer:contractor)	50:50			
	Base Month	Current Month	% Change	Applicable for Fluctuation Adjustment?
CPI (or any specified index)	100	118	18%	Yes
Calculation of Fluctuation Adjustment				
Total Value of Work Done to Date (before adjustment for fluctuation)		10,000,000		
Less: Total Value of Work Done up to last valuation period (before adjustment for fluctuation)		8,000,000		
Value of Work Done in this period		2,000,000		
Deduct portion of Non-Adjustable Elements				
40% x HK$2,000,000		800,000		
Value of Work Done adjustable for fluctuation		1,200,000		
Net change of CPI (or any specified index) above threshold				
18.0% - 15.0% = 3.0%		3.0%		
Fluctuation Amount for this period		36,000		
Risk-Sharing Proportion borne by contractor		50%		
Net Fluctuation Adjustment payable for this period		18,000		

Risk Proportion Approach
Calculation of Fluctuation Adjustment

1.3 - SCENARIO C – Employer taking 100% of Risk				
Proportion of Non-Adjustable Elements	15%			
Minimum threshold of Fluctuation	±20%			
Risk-Sharing Ratio (employer:contractor)	100:0			
	Base Month	Current Month	% Change	Applicable for Fluctuation Adjustment?
CPI (or any specified index)	100	130	30%	Yes
Calculation of Fluctuation Adjustment				
Total Value of Work Done to Date (before adjustment for fluctuation)		10,000,000		
Less: Total Value of Work Done up to last valuation period (before adjustment for fluctuation)		8,000,000		
Value of Work Done in this period - Effective Value		2,000,000		
Deduct portion of Non-Adjustable Elements				
15% x HK$2,000,000		300,000		
Value of Work Done adjustable for fluctuation		1,700,000		
Net change of CPI (or any specified index) above threshold				
30.0% - 20.0% = 10.0%		10.0%		
Fluctuation Amount for this period		170,000		
Risk-Sharing Proportion borne by employer		100%		
Net Fluctuation Adjustment payable for this period		170,000		

5.2.2 CAP

The CAP approach is an extension of the Risk Proportion Approach, described in 5.2.1, whereby the fluctuation adjustment is capped under the contract sum such that the risk beyond a threshold is taken by one party only.

Under the CAP approach, the employer sets a ceiling for fluctuations beyond which the risk will be borne solely by the employer or the contractor. For example, if the employer stipulates the first ±15% of price changes will not be subject to fluctuation adjustment, but in addition puts a ceiling of ±40% on the price fluctuation and decides that any price fluctuation beyond 40% will be borne solely by the contractor, then when the price fluctuates by, say, +45%, the employer will only share the risk of +25% (40% - 15%) with the contractor in the agreed Risk-Sharing Ratio. The contractor will have to bear the fluctuation risk of the remaining 5% (45% - 40%).

Alternatively, if the employer decides that the fluctuation risk above the ceiling of ±40% will be borne solely by the employer, then the contractor will receive adjustment for the remaining 5%.

Please refer to Worked Examples 2.1 and 2.2 on the following pages for demonstrations of this approach.

A sample of the fluctuation clause is shown in Appendix A2.

Worked Example 2 - CAP Approach

Calculation of Fluctuation Adjustment

2.1 - SCENARIO A – Additional risk above CAP borne by **contractor**					
Proportion of Non-Adjustable Elements	40%				
Minimum threshold of Fluctuation	±15%				
CAP of Fluctuation	±40%				
Risk-Sharing Ratio (employer:contractor)	50:50				
Fluctuation above CAP to be borne by contractor					
	Base Index Figure	Current Index Figure	% Change	Eligible for Fluctuation Adjustment?	Above CAP percentage?
CPI (or any specified index)	100	145	45.0%	Yes	Yes
Calculation of Fluctuation Adjustment					
Total Value of Work Done to Date (before adjustment for fluctuation)		10,000,000			
Less: Total Value of Work Done up to last valuation period (before adjustment for fluctuation)		8,000,000			
Value of Work Done in this period - Effective Value		2,000,000			
Deduct portion of Non-Adjustable Elements					
40% x HK$2,000,000		800,000			
Value of Work Done adjustable for fluctuation		1,200,000			
Net change of CPI (or any specified index) above threshold					
40.0% - 15.0% = 25.0%		25.0%			
Fluctuation Amount for this period		300,000			
Risk-Sharing Proportion borne by contractor		50%			
Net Fluctuation Adjustment payable for this period		150,000			

CAP Approach
Calculation of Fluctuation Adjustment

2.2 - SCENARIO B – Additional risk above CAP borne by **employer**					
Proportion of Non-Adjustable Elements	40%				
Minimum threshold of Fluctuation	±15%				
CAP of Fluctuation	±40%				
Risk-Sharing Ratio (employer:contractor)	50:50				
Fluctuation above CAP to be borne by employer					
	Base Index Figure	Current Index Figure	% Change	Eligible for Fluctuation Adjustment?	Above CAP percentage?
CPI (or any specified index)	100	145	45.0%	Yes	Yes
Calculation of Fluctuation Adjustment					
Total Value of Work Done to Date (before adjustment for fluctuation)		10,000,000			
Less: Total Value of Work Done up to last valuation period (before adjustment for fluctuation)		8,000,000			
Value of Work Done in this period		2,000,000			
Deduct portion of Non-Adjustable Elements					
40% x HK$2,000,000		800,000			
Value of Work Done adjustable for fluctuation		1,200,000			
Net change of CPI (or any specified index) above threshold					
40.0% - 15.0% = 25.0%		25.0%			
Fluctuation Amount for this period		300,000			
Risk-Sharing Proportion borne by contractor		50%			
Sub-total		150,000			
Add: Risk beyond CAP borne by employer					
(45.0% - 40.0%) x 1,200,000		60,000			
Total Fluctuation Amount for this period		210,000			

Note: 100% of the risk above the 40% CAP will be borne by the employer

5.2.3 Target Cost

Under this system, a Target Cost is agreed between the employer and the contractor. The employer will also agree a Pain/Gain-Sharing Ratio with the contractor, which is usually in the region of 50:50. The aim of both the employer and the contractor is to execute the works within the Target Cost. Any savings (Gain) on the Target Cost will be shared between the employer and the contractor in the Pain/Gain-Sharing Ratio. Similarly, any additional spend (Pain) above the Target Cost will be shared in the same ratio. The contractor may also negotiate a cap on the pain whereby any expenditure above the cap will be borne solely by the employer.

The contract can be formed via a two-stage process. During Stage One, certain elements which the tenderer considers “price volatile” (usually defined as Specified elements in the target cost contract) are specified by the tenderer as being elements in the Target Cost that the tenderer wishes to be adjustable. The Specified elements can usually be classified into the following three categories and normally the tenderer is allowed to select a limited number of Specified elements for each of the categories:

- Commodities and Materials
- Site Labour
- Contractor’s Equipment

During Stage Two, the tenderer provides information on the planned consumption and estimated unit price of each Specified Element in the tender document. The planned consumption should be broken down according to each valuation period to facilitate the future calculation of the adjustments. The agreed planned consumption, calculated at the estimated unit rates, will form the initial target cost. All other costs will remain fixed for the contract duration.

At the end of each valuation period the employer will make adjustments to the Target Cost to take into account of differences between the actual weighted average price paid by the contractor for the Specified elements in the valuation period and the estimated unit prices of the Specified elements used in the determination of the initial Target Cost.

Adjustment to the Target Cost is calculated in accordance with the following formula:

Adjustment = A x (C – B), where:

A = the planned or actual consumption of the Specified Element for that valuation period identified in the Contract

B = the estimated unit price used in the determination of the initial Target Cost

C = the weighted average unit price paid by the contractor in respect of that Specified Element during the valuation period

The Target Cost will be adjusted by the sum of the adjustments in respect of each of the Specified Elements.

The target cost system is suitable for contracts involving a great deal of uncertainty and potential high risk to both the employer and the contractor. As it can be administered in two tendering stages, it offers the tenderers a better understanding of the requirements of the contract and also seeks to reduce the risk of future disputes. Furthermore, it promotes a joint incentive to achieve savings on the Target Cost so that any resulting gain can be shared.

Please refer to Worked Example 3 on the following pages for a demonstration of this approach.

A sample of the fluctuation clause is shown in Appendix A3.

Worked Example 3 - Target Cost Approach

List of Specified elements

Quantity should match with the total shown in the Breakdown table

SPECIFIED ELEMENTS

SPECIFIED ELEMENTS (Commodities & Materials)		Planned consumption used in the determination of the Target Cost	Estimated unit price used in the determination of the Target Cost
1	STEEL	5,000 tonnes	HK$7,000/t
2	GALVANIZED MILD STEEL	3,000 kg	HK$80/kg
3	CONCRETE	100,000 cu. m	HK$350/cu.m

`

SPECIFIED ELEMENTS (Site Labour)		Planned consumption used in the determination of the Target Cost	Estimated unit price used in the determination of the Target Cost
4	CONCRETER	120,000 man-hours	HK$800/manhour
5	STEELWORKER	150,000 man-hours	HK$1,200/manhour
6			

SPECIFIED ELEMENTS (Contractor's Equipment)		Planned consumption used in the determination of the Target Cost	Estimated unit price used in the determination of the Target Cost
7	TUNNEL BORING MACHINE	2	HK$XM/no
8			
9			

Worked Example 3

Target Cost Approach

BREAKDOWN OF PLANNED CONSUMPTION OF SPECIFIED ELEMENTS

Valuation Period	Month	Planned consumption of Specified elements included in the determination of the Target Cost								
		1	2	3	4	5	6	7	8	9
1	Jan XX	200	150							
2	Feb XX	220	175							
3	Mar XX	215	200							
4	Apr XX	250	150							
5	May XX	300	325							
6	Jun XX	350	…							
7	Jul XX	400	…							
8	Aug XX	600	…							
9	Sep XX	800	…							
10	Oct XX	800	…							
11	Nov XX	500	…							
12	Dec XX	250	…							
13	Jan YY	115	…							
	Total	5000								

The total of each column should match the Planned Consumption stated in the Schedule of Specified elements

Worked Example 3

Target Cost Approach
Calculation of Fluctuation Adjustment

Specified Element = STEEL									
		Jan	**Feb**	**Mar**	**Apr**	**May**	**. . . .**	**. . . .**	**Total**
Planned Consumption during Valuation Period in Tonnes	A	200	220	215	250	300	. . . .	. . . .	
Estimated price allowed in the determination of the Initial Target Cost in HK$	B	7,000	7,000	7,000	7,000	7,000	. . . .	. . . .	
Weighted average price paid for the Specified Element during the Valuation Period in HK$	C	7,212	7,412	7,200	6,800	6,500	. . . .	. . . .	
	D = C - B	212	412	200	-200	-500	. . . .	. . . .	
Target Adjusted by HK$	A x D	42,400	90,640	43,000	-50,000	-150,000	. . . .	. . . .	-23,960

Notes

- The target cost fluctuation adjustment should be calculated on a monthly basis
- The weighted average price for the Specified Elements should be justified with invoices of the contractor
- If there is a variation order which affects the Planned Consumption, the quantity should be adjusted accordingly

5.2.4 PFF

Under the PFF approach, a Price Fluctuation Factor will be calculated for each of the Adjustable Elements in the Contract. The individual Price Fluctuation Factors will be consolidated to form the Combined Price Fluctuation Factor (CPFF), which will be applied to the Effective Value of the valuation period to calculate the fluctuation adjustment.

The PFF Approach can be summarized in the following formula:

$$CPFF = a\left(\frac{X_i - X_0}{X_0}\right) + b\left(\frac{Y_i - Y_0}{Y_0}\right) + c\left(\frac{Z_i - Z_0}{Z_0}\right) + ... + n\left(\frac{N_i - N_0}{N_0}\right)$$

Fluctuation Adjustment = CPFF x Effective Value

The sum of a + b + c + …. + n + K must be equal to 1.

Notations

CPFF	=	Combined Price Fluctuation Factor
a, b, c, … n	=	Weightings (as percentages) of the Adjustable Elements in the Schedule of Proportions
X_i, Y_i, Z_i …N_i	=	Current Index Figures of the Adjustable Elements in the Schedule of Proportions
X_0, Y_0, Z_0 …N_0	=	Base Index Figures of the Adjustable Elements in the Schedule of Proportions
K	=	Fixed Proportion of Contract sum not subject to Fluctuation Adjustment

The PFF approach is suitable for both public and private sector construction contracts where there is a number of cost elements that are expected to fluctuate, and can be used for medium to large civil, building and E&M works.

The following outlines the major steps in carrying out the PFF approach for CPFS.

1. Determining the Non-Adjustable portion of the Contract sum

   The employer can specify either a fixed percentage or a minimum percentage in the Schedule of Proportions. If a minimum percentage is specified, then the tenderer should be allowed to specify the exact percentage of the Non-Adjustable proportion. For instance, if the employer specifies a minimum proportion of 40% of the Contract sum that is not subject to fluctuation, then the tenderer should be allowed to fill in any figure between 40% and 100% that is non-adjustable in the Schedule of Proportions.

2. Determining the elements in the Contract that are subject to fluctuation

   The employer shall include in the Schedule of Proportions those major elements for which in his opinion the prices may fluctuate most according to past records.

3. Determining the indices for Adjustable Elements

   The indices selected shall be readily obtainable in the market and published on a regular (preferably monthly) basis. Since the publication of those indices usually has a lag time behind the current month, if there is more than one index available, the one that is published more frequently or concurrent to the works should be chosen.

4. Determining the effective date of the CPFS

   There is usually a lag time between the contract being awarded and the first ordering of materials or recruitment of labour under the contract. Depending on their nature, this period will vary among different construction contracts. Starting to implement the CPFS too early may render an unnecessary adjustment to the payment amount, while a late implementation may defeat the original intent of the CPFS. Therefore the employer can specify a lag time after due consideration of the nature and duration of the contract.

5. Determining the frequency of the fluctuation adjustment

   For construction materials, there usually exists a pattern in which the materials are ordered. For example, steel reinforcement and concrete for a civil contract are usually ordered throughout the construction period, while copper (cable) for an E&M contract is usually ordered early and on a one-off basis. The employer should refer to such spending or procurement patterns when determining how often the relevant material indices should be updated (e.g. monthly or one-off) to calculate the Fluctuation Adjustment.

   For labour, since wages are generally paid on a monthly basis, the labour indices should be updated on a monthly basis for the Fluctuation Adjustment calculation with due consideration may be given to the installation period relative to the overall programme.

6. Provision of the fluctuation clauses in the contract

   The employer should provide the terms and conditions of the fluctuation calculation in the conditions of contract. A sample of the fluctuation clause is shown in Appendix A4.

   Please refer to Worked Examples 4 and 5 on the following pages for demonstrations of the application of the PFF approach in civil/building contracts and E&M contracts respectively.

Worked Example 4 - PFF Approach for Civil and Building Contracts

Note 1 Note 2 Note 4 Note 7 Note 8

Item of Labour and Selected Materials applicable to this Contract	Source of Index Figures	Percentage of "Effective Value" of the Works			Calculated Proportions	Index Figures		Price Fluctuation Factor
		LIMITS		TENDER	Index Proportion	Base	Current	
		Max.	Min.	(Whole number)	(0.0085x(3))			
				(*)	(#)			(7) = (4) x [(6) - (5)]/(5)
(Column No.)	-	1	2	3	4	5	6	7
Composite labour for civil engineering contracts	A	45	30	40	0.34	84.8	85.3	0.00200472
Aggregates	B	15	5	5	0.0425	98.1	117.7	0.00849134
Bitumen	B	5	1	5	0.0425	102.9	113.5	0.00437804
Diesel fuel	B	15	5	10	0.085	282.1	283.4	0.00039171
Steel reinforcement	B	15	5	10	0.085	328.8	362.5	0.00871198
Galvanised mild steel	B	15	5	10	0.085	330.1	363.4	0.00857467
Portland cement (ordinary)	B	15	5	10	0.085	259.5	243.2	(0.00533911)
Timber formwork	B	15	5	10	0.085	128.1	128.1	0
All other costs not subject to adjustment	-	-	-	-	0.15			
TOTAL		-	-	100	1	Combined Price Fluctuation Factor		0.02721334

(*) Column (3) to be filled in by the Tenderer within the limits set in columns (1) and (2)
(#) Column (4) to be completed by the Employer after receipt of Tender.

Note 3 Note 5 Note 6 Note 9

Notes on the preparation of the Schedule of Proportion

Note 1 – The employer should determine the Adjustable Elements and the proportions of the Non-Adjustable Elements

Note 2 – The employer should specify the index figures against which changes in price of the associated Adjustable Elements are calculated. For the example given, the sources of index figures can be:

Source of Index Figures

A - Cost of Labour Index is the Composite Labour Wages Index for Building Contracts in the "Table 112: Index Numbers of the Cost of Labour and Materials used in Public Sector Construction Projects (April 2003=100)" series compiled by the Census and Statistics Department of the Government of HKSAR

B - Cost of Materials Indices are the Cost of Materials Indices for Building Contracts in the "Table 113: Index Numbers of the Cost of Labour and Materials used in Public Sector Construction Projects (April 2003=100)" series compiled by the Census and Statistics Department of the Government of HKSAR

Note 3 – The percentage limits for each of the Adjustable Elements are to be inserted by the employer

Note 4 – Column (3) to be inserted by the tenderer. The value of the percentage for each of the Adjustable Elements must be within the range set in Columns (1) and (2)

Notes on the preparation of the Schedule of Proportion

Note 5 – The total of Column (3) shall be equal to 100%

Note 6 – The percentage in Column (3) is multiplied by the percentage of Adjustable Elements

Note 7 – The contractor shall insert the base and current index figures in accordance with the guidelines given

Note 8 – The Price Fluctuation Factor (PFF) for each individual Adjustable Element (AE) is given as:

$$\text{PFF} = \text{Proportion of AE} \times \frac{\text{Current Index Figures} - \text{Base Index Figures}}{\text{Base Index Figures}}$$

Note 9 – The Combined PFF is the sum of all the individual PFF's

PFF Approach for
Civil and Building Contracts
Calculation of Fluctuation Adjustment

Interim Payment Application No. [ ]			
for the period ending:			
Summary of Fluctuation Calculation	Note 1		
Statement of Effective Value	Note 2		Amount
Total Estimated Value			175,000,000.00
Less:			
Value of Work and/or material based on actual cost or current price	Note 3		0.00
Amount of NSC's Work done			10,000,000.00
Net amount	Note 4	*(A)*	165,000,000.00
Less:			
Previous Effective Value		*(B)*	150,000,000.00
EFFECTIVE VALUE of Work on this Certificate (E.V.)	Note 5	*(A) – (B)*	**15,000,000.00**
Calculation of Price Fluctuation Factor	Note 6		
Price Fluctuation Factor (PFF) of [period]			0.02721334
Amount Payable / Deductible for Price Fluctuation	Note 7		
Fluctuation of this month (PFF) x (E.V.)	Note 8	*(C)*	408,200.10
Fluctuation adjustment up to Interim Payment No. [xx]		*(D)*	8,000,000.00
Running Total		*(C)+(D)*	8,408,200.10

Notes on the preparation of the calculation of Fluctuation Adjustment

Note 1 – The Total Estimated Value of Work is equivalent to the total value of work done as calculated in the interim payment certificate statement

Note 2 – All NSC works and works priced in actual costs have to be deducted from the Total Estimated Value of Work to arrive at the net amount (A)

Note 3 – The Previous Effective Value of Work (B) is equivalent to the total value of work done in the previous interim payment certificate statement

Note 4 – The Effective Value of Work on the current Certificate is the difference between (A) and (B) above

Note 5 – The Price Fluctuation Factor is carried forward from the Schedule of Proportions

Note 6 – The Fluctuations for this month (C) is calculated by multiplying the Effective Value of Work in the current Certificate and the Price Fluctuation Factor

Note 7 – The Fluctuation adjustment up to the last interim payment (D) is the Running Total calculated in the last interim payment certificate

Note 8 – The Running Total (E) is the sum of (C) and (D) above

Worked Example 5 - PFF Approach for E&M Contracts

Schedule of Proportions

Note 1 Note 2 Note 4 Note 6 Note 7

Group	Elements	Source of Index Figures	Percentage		Index Figures		Price Fluctuation Factor
			Range	Proportion Inserted by Tenderer	Base	Current	(6) = (3) x [(5) - (4)]/(4)
	(Column No.)	1	2	3	4	5	6
(i) Material Index	Copper	A	0% ~ 30%	15%	98.1	112.1	0.021406728
	Galvanized Mild Steel	B		15%	124.3	118.1	(0.007481899)
(ii) Labour Index	Plumber	C	0% ~ 30%	10%	276.7	285.0	0.00299964
	Electrical Fitter (incl. Electrician)			5%	171.2	176.0	0.00140187
	Mechanical Fitter			5%	240.3	249.9	0.00199750
	Lift & Escalator Mechanic			10%	173.8	180.8	0.00402762
	All other elements not subject to adjustment		40%~ 100%	40%			
	TOTAL			100%	Combined Price Fluctuation Factor		0.0024351459

Note 3 Note 5 Note 8

Notes on the preparation of the Schedule of Proportions

Note 1 – The employer should determine the Adjustable Elements and classify them into the Materials and Labour groups. The employer should also determine the proportion of Non-Adjustable Elements (being 40% in the case of the example).

Note 2 – The employer should specify the index figures against which changes in price of the associated Adjustable Elements are calculated. For the example given, the sources of index figures can be:

Code	Source of Index	Base Index Figure	Current Index Figure
A	Cash Buyer Price for Copper Grade A published by London Metal Exchange	42 Days prior to Tender Return Date	See Note 9
B	The index of Galvanised Mild Steel from "Table 113: Index Numbers of the Costs of Labour and Materials used in Public Sector Construction Projects (April 2003 = 100)" published by Census and Statistics Department of HKSAR		
C	The index from "Average Daily Wages of Workers Engaged in Public Sector Construction Projects as Reported by Main Contractors" published by the Census and Statistics Department of HKSAR	42 Days prior to Tender Return Date	See Note 9

Note 9

Notes on the preparation of the Schedule of Proportions

Note 3 –Column (2) The range of proportion of the Adjustable Elements is to be inserted by the Employer

Note 4 – Column (3) to be inserted by the tenderer. The total of Column (3) for each group of the Adjustable Elements shall not exceed the range specified in Column (2)

Note 5 – The total of Column (3) shall be equal to 100%

Note 6 – The contractor shall insert the base and current index figures in accordance with the guidelines given

Note 7 – The Price Fluctuation Factor (PFF) for each individual Adjustable Element (AE) is given as:

$$\text{PFF} = \text{Proportion of AE x} \frac{\text{Current Index Figures} - \text{Base Index Figures}}{\text{Base Index Figures}}$$

Note 8 – The Combined PFF is the sum of all the individual PFF's

PFF Approach for
E&M Contracts

Notes on the preparation of the Schedule of Proportions

Note 9 – The employer shall specify how to determine the Current Index Figure for the valuation period concerned and how to handle the calculation of the PFF when there is a time lag between the valuation period and publication date of the index figures. The employer can refer to the typical statements given below:

1.	The Current Index Figure for Group (i) shall be fixed and equal to the respective Base Index Figure for those interim payments in respect of which the last Date of Valuation Period is on or before (a) the date of achievement of Milestone [XX} or (b) [exact date], whichever is the earliest.
	Thereafter the Current Index Figure shall be changed ONCE only to the respective published index as referred to in the Source of Index and those indices shall be used up to and including the Final Payment.
2.	The Current Index Figure for Group (ii) shall be fixed and equal to the respective Base Index Figure during the period from the Date of Commencement to [date], and thereafter changed MONTHLY in accordance with the published index applicable to:
(a)	the due date (or extended date) for substantial completion of the whole of the Works, or
(b)	the date of substantial completion of the whole of the Works certified pursuant to the Conditions of Contract, or
(c)	the last day of the Valuation Period to which the Interim Payment Certificate relates, whichever is the earliest.
3.	Provided that if any of the Current Index Figures have not been published prior to the due date for the issue of any payment certificate, the adjustment in respect of that certificate will be provisionally calculated and added to or deducted from the sum payable in the certificate by the Employer using the latest published Current Index Figures and shall be corrected in the next payment certificate following the publishing of the relevant Current Index Figures.
4.	Provided that if the Base Index Figure / Current Index Figure is unavailable due to a holiday, the index figures prior to the holiday shall be used in calculating the Base and/or Current Index Figures.

Worked Example 5

PFF Approach for
E&M Contracts
Calculation of Fluctuation Adjustment

Interim Payment Application No. [ ]			
for the period ending:			
Summary of Fluctuation Calculation			
Statement of Effective Value			Amount
Total Estimated Value of Work	(A)	Note 1	175,000,000.00
Less:			
Previous Cumulative Effective Value of Work	(B)	Note 2	150,000,000.00
EFFECTIVE VALUE of Work on this Certificate (E.V.)		Note 3	**25,000,000.00**
Calculation of Price Fluctuation Factor			
Price Fluctuation Factor (PFF) of [period]		Note 4	0.0024351459
Amount Payable / Deductible for Price Fluctuation			
Fluctuation of this month = PFF x E.V	(C)	Note 5	608,786.48
(For the first adjustment of the Current Index Figure for Materials only)			
Add: Fluctuation not previously adjusted = PFF for material* x Previous Cumulative E.V. of Work	(D)	Note 6	2,088,724.38
Total Fluctuation of this month	(E) = (C) + (D)		2,697,510.86
Fluctuation adjustment up to Interim Payment No. [xx]	(F)	Note 8	15,000,000.00
Running Total	(G) = (E) + (F)		17,697,510.86

Note 7

* In this example the PFF for material is equal to 0.021406728-0.007481899 = 0.013924829 (please refer the Schedule of Proportions on page 48). The Fluctuation not previously adjusted is therefore 0.013924829 x HK$150,000,000 = HK$2,088,724.35.

PFF Approach for
E&M Contracts

Notes on the Calculation of Fluctuation Adjustment

Note 1 – The Total Estimated Value of Work (A) is equivalent to the total value of work done as calculated in the interim payment certificate statement

Note 2 – The Previous Cumulative Effective Value of Work (B) is equivalent to the total value of work done in the previous interim payment certificate statement

Note 3 – The Effective Value of Work on the current Certificate is the difference between (A) and (B) above

Note 4 – The Price Fluctuation Factor is carried forward from the Schedule of Proportions

Note 5 – The Fluctuations for this month (C) is calculated by multiplying the Effective Value of Work in the current Certificate by the Price Fluctuation Factor

Note 6 In instances where the Current Index Figure for materials is only adjusted once (see statement (1) under Note 9 on page 50), the employer may consider the option of applying the fluctuation adjustment to payments prior to the first adjustment of the material indices. The Fluctuation for the payment(s)not previously adjusted (D) is calculated by multiplying the Previous Cumulative Effective Value of Work (B) by the Price Fluctuation Factor for material.
No further adjustment is required after the first adjustment has been made.

Note 7 – The Fluctuations adjustment up to the last interim payment (F) is the Running Total calculated in the last interim payment certificate

Note 8 –The Running Total (G) is the sum of (E) and (F) above

5.2.5 Summary of the Approaches

Approach	Main Characteristics	Mechanism	Applicability
Risk Proportion	Use of a composite index for tracking all Adjustable Elements	- Employer to mandate percentage of Non-Adjustable Elements and the minimum level of price fluctuation for applying CPFS - Employer to mandate/agree with contractor the Risk-Sharing Ratio	- Suitable for all civil, building and E&M contracts with few major cost elements, and - Where employer has a limited appetite for risk sharing
CAP	- Fluctuation Adjustment capped under a threshold percentage of the Contract sum - Risk beyond threshold to be borne by one party only	- Employer mandates the threshold percentage - Employer mandates / agrees with contractor the party to bear risk beyond the threshold	- Similar to Risk Proportion Approach but, - Where employer wants to limit the ceiling of risk sharing
Target Cost	- Target Cost and Pain/Gain-sharing ratio agreed between employer and contractor - Contract formed in two tender stages - Identification of Specified elements in Stage One and their planned consumption and estimated unit prices in Stage Two	- Adjustment to Target Cost based on difference between actual and estimated unit prices of Specified elements at each valuation period	Suitable for contracts with high levels of uncertainty and/or risk.
PFF	- Separate Price Fluctuation Factor calculated for each Adjustable Element - A Combined PFF consolidated from the individual PFF's	- Employer to mandate: (i) Fixed/minimum percentage of Non-Adjustable Elements in Schedule of Proportions (ii) Adjustable Elements, their associated indices and maximum weightings (iii) Effective date of CPFS and the frequency of adjustment - Tenderer to complete the weightings of the Adjustable Elements in the Schedule of Proportions subject to constraints set by employer	Suitable for - Contracts Where the employer generally accepts the risk of cost fluctuations - Contracts where there are a number of varied cost Elements, - Medium to large civil, building and E&M contracts

5.3 Cost Elements that may be subject to CPFS and available indices

5.3.1 Labour and Materials

The Adjustable Elements can be classified under the categories of Labour, Materials and, in certain situations, Currency. Each category can be further divided into more specific items. For instance, labour can be further classified as General Workers, Concreter, Bricklayer etc. and materials can be further classified as Steel, Formwork, Copper etc.

The Hong Kong Census and Statistics Department (CENSTATD) provides a range of indices against which price movement for labour and materials can be measured. For labour, CENSTATD provides indices for both composite labour and individual labour types. For materials, the indices for the most common construction materials are also listed. For copper (Grade A), which is a common material in most E&M and BS contracts and is most susceptible to price fluctuations, a more appropriate reference for the index can be found from the London Metal Exchange (LME) website, which gives daily updates of the copper price.

A list of the available indices for labour and materials is given in Appendix B.

5.3.2 Currency Fluctuation

Exchange rates are also an important factor to consider when formulating the fluctuation strategy for contracts that are exposed to currency movement. The risk of fluctuations can normally be handled by hedging performed by either the employer or the contractor individually and no particular provisions in the contract are generally required. However, if the employer wishes to, he can allow a provision in the contract to cater for a one-off adjustment due to currency fluctuation after the contract is awarded. The employer can consider including in the contract a formula for calculating currency fluctuation as follows:

Currency Fluctuation Factor (CFF) = (X1 – X0)/X0

where

X1 = Exchange rate of foreign currency at Month M

X0 = Exchange rate of foreign currency at awarding of contract

M = the month for adjustment to be agreed between the employer and the contractor

Adjustment made to the Contract sum = Contract sum x CFF

5.3.3 Non-Adjustable Elements

The Non-Adjustable Elements represent the portion of the contract sum that is not subject to the risk of fluctuation in price. Typical examples of Non-Adjustable Elements are the preliminaries items in a contract such as the insurance, bond and guarantees, contractor’s facilities and other project

management costs. The employer should determine the percentage of the contract sum which is represented by the Non-Adjustable Elements and insert this percentage in the Schedule of Proportions so that the sum of the proportions for the Adjustable Elements and the Non-Adjustable Elements always equates to 100%.

5.4 Application of CPFS in different types of contracts

5.4.1 Civil and Building Contracts

Owing to the size and complexity of civil and building contracts, there can be numerous Adjustable Elements, including materials such as concrete, steel, formwork, aluminium and galvanized mild steel and labour types such as formworkers, scaffolders mechanics, electricians, plasterers, bricklayers etc. Finding a suitable index for each of the Adjustable Elements is possible, but the administrative work involved can be substantial, particularly where there are different sources of indices for different Adjustable Elements. As a result, and for the sake of simplicity, the employer may first consider the use of the Risk Sharing Approach or the CAP approach for these contracts.

If the employer is looking for more precise estimation of the impact of price fluctuation, he should consider the use of the PFF approach.

The application of the PFF approach is common for construction contracts for Development Bureau, Housing Authority and MTRCL. With regard to its application for the private construction sector, the employer should consider factors such as the contract type, contract sum and contract duration when determining whether the PFF approach is appropriate.

5.4.2 Electrical and Mechanical Contracts

The Adjustable Elements of E&M Contracts commonly consist of materials such as copper and galvanized mild steel and labour of various types (e.g. plumber, electrical fitter, mechanical fitter). If the employer wishes to use a simple and easy method to cater for the fluctuation risk, he can choose the Risk Proportion Approach or the CAP approach. For complex or high-value contracts, it is recommended that the PFF approach is adopted. Basically the methodology is similar to that for the civil and building contracts: however, the procurement strategies and spending patterns of the contractors in the E&M sector are somewhat different from those in civil & building. In order to reflect these differences, some variations should be adopted which include:

(a) the non-adjustable portion of the contract sum for E&M contracts can be higher than that for civil/building contracts because of the relatively higher percentage of costs that are within acceptable risk boundaries of the E&M market;

(b) the price index of materials (or currency) used for the calculation of the Price Fluctuation Factor can be calculated as a “one-off” adjustment such that subsequent index figures will be frozen at that “one-off” figure.

5.4.3 Target Cost Contracts

The use of the target cost approach for the fluctuation adjustment is designed for this form of contracting. Therefore it is important for the employer to firstly determine whether a target cost contract is suitable for the project.

(a) Agreeing the Pain-Share and Gain-Share Ratio

Once it is decided to use the Target Cost system for the contract, then the employer should decide the Pain/Gain-Share Ratio with the tenderer during Stage 1 of the tendering process.

(b) Agreeing the Specified elements and their Planned Consumption

The tenderer will be required to advise, in Stage 2, the elements of their cost structure which they estimate will be affected by price fluctuations and to also advise the planned consumption, on a monthly basis, throughout the contract period.

(c) Calculating the fluctuation adjustment

After the contract is awarded, the contractor should submit, together with the payment application, a schedule which contains the weighted average of the prices paid for the Specified elements. This weighted price average will be used against the estimated price of the Specified elements provided by the contractor at the tender stage to compute the fluctuation adjustment for the specified elements in the valuation period.

(d) Dealing with Variations

In case the quantities of the specified elements are varied as a result of variations or value engineering during the course of the contract, the planned consumption figures may be adjusted accordingly to reflect such increase or reduction for the purpose of calculating the fluctuation adjustment.

5.4.4 Term Contracts

Term contracts, usually for minor works, feature a higher number of purchase orders (transactions), each of relatively small value. The Employer can issue a purchase order at any time during the validity of the term contract based on the pre-agreed unit prices in the Schedule of Rates, and the required quantity for the job. The unit prices are usually valid for one year and adjusted every year. Thus, efficiency and convenience should be given prime consideration in defining the PFF system. The example given has the following unique features:

(a) Adjustable Elements are defined based on the nature of the work, and each Adjustable Element consists of both materials and labour

(b) The unit of Adjustable Elements is adjusted once every year and applied for the whole year

Another challenge for term contracts is that the actual quantities of materials and labour used cannot be accurately forecast. The price adjustment for Adjustable Elements can take one of the following forms:

(a) Same adjustment percentage for all Adjustable Elements, as shown in the Example. The adjustment percentage will have to take account of the weighted average of the past consumption. This has the advantage that

both parties are assured of the percentage increase (or decrease) for the whole adjustment year; OR

(b) Each Adjustable Element has a different adjustment percentage calculated based on the cost structure. This in theory should reflect more closely the actual change in the cost base. However, there are always concerns in this approach regarding:
- the timeliness of the published price information;
- the fact that such information does not always represent accurately the actual price trend; and
- that future consumption may deviate significantly from past consumption given that there is overall price uncertainty for both employer and contractor.

It is recommended that the employer consult the contractor in deciding the most appropriate approach in designing the PFF.

Please refer to Worked Example 6 on the following page for a demonstration.

Worked Example 6 – PFF Approach for Term Contract (Minor Works)

Schedule of Proportions

Note 3 Note 6 Note 8 Notes 4 & 5

Adjustable Elements (Based on ASD's SOR)		Proportion	Index Change	Fluctuation Factor
		(a)	(b)	(a) * (b)
Section 01	Excavation	0.67%	0.48%	0.0000322
Section 02	Concrete Work	8.83%	10.64%	0.0093951
…				
Section 10	Steel and Metal Work	31.37%	0.23%	0.0007215
Section 11	Plasterwork, Floor, Wall and Ceiling Finishes	6.40%	10.14%	0.0064896
…				
Section 15	Painting	7.31%	2.74%	0.0020029
…				
Section 27 to 30	Electrical Installation	13.37%	-0.80%	(0.0010696)
…				
Section 33 to 34		12.77%	-0.80%	(0.0010216)
Section 35		19.28%	1.33%	0.0025642
…				
	Total	100.00%		0.0191144

Note 7

Notes on the preparation of the Schedule of Proportions

Note 1 – A Minor Works Term Contract can be adjusted once each year to balance effort and risk.

Note 2 – The example here is for a five-year term contract with firm prices for the first two years and then annual adjustment for subsequent years. The contract commences in June 2008 with the base index for each adjustment element being the average between Jan 2007 and Dec 2007.

Note 3 – The Employer may choose to adopt a commonly used Schedule of Rates as Adjustable Elements, such as that from Architectural Services Department (ArchSD), or establish his own Schedule of Rates (SoR) in conjunction with the contractor.

Worked Example 6

PFF Approach for
Term Contract (Minor Works)

Note 4 – Only major cost elements are shown for simplicity.

Note 5 – There are rate items not directly covered by ArchSD's Schedule of Rates. The adjustment mechanism, if applicable, is to be agreed with the contractor, and normally they are grouped into one of the standard rate items for the purpose of price adjustment.

Note 6 – The Proportions are based on the usage for the previous two years.

Note 7 – The employer may impose a cap on the adjustment to limit the price increase. One example would be to impose a cap of 2% with support to the contractor to introduce value engineering to reduce the cost or improve value to the employer.

Note 8 – Index Change for Excavation is illustrated below. The price indices are from the Census and Statistics Department of HKSAR.

	Base Index Average Jan – Dec 2007	**Current Index Average Jan – Dec 2009**	**Proportion**	**Fluctuation %**
	(a)	(b)	(c)	[(b)-(a)]/(a)*(c)
Labour	570.46	572.29	75%	0.24%
Material				
- Aggregates	39.8	49.42	1%	0.24%
			Total	**0.48%**

5.4.5 Design Consultancy Contracts

The Adjustable Elements of Design Consultancy Contracts consist mainly of the salary costs of consultant firms' professional and technical personnel and rental for office premises. In general, these costs would be adjusted on an annual basis and therefore CPFS is not normally required for Design Consultancy Contracts with a duration of one year or less. Lump sum fees for consultancy contracts of a planned duration of greater than one year may be adjusted to account for inflation.

In a situation where the employer wishes to adopt CPFS for design consultancy contracts, adjustments can be made annually to the balance of the lump sum fee earned in accordance with, for example, increases and decreases in the CPI (C) or any specified index published by the Census and Statistics Department.

Please refer to Worked Example 7 on the following page. In addition to the adjustment to the Lump Sum Fees, the time charge rates and the resident site staff on-cost rates of the consultancy agreement are adjusted proportionally to increases and decreases in the CPI (C) or any specified index on the day after the first and every subsequent anniversary of the agreement.

Worked Example 7 – Fluctuation Adjustment for Design Consultancy Contracts

Calculation of Fluctuation Adjustment

Worked Example of Adjustment to Lump Sum Fees due to Change in the Consumer Price Index (C) (or any specified index)						
Agreement No.						
Title						
Lump Sum Fee		$6,280,000.00				
Commencement		Year 0				
a	b	c	d	e		f
Year	Consumer Price Index (C)	Services Rendered ($)	Lump Sum Unearned ($)	Payment for Fluctuation ($)		Cumulative Fluctuation Payment ($)
0	105.7	-	6,280,000.00		-	-
1	112.3	3,624,418.00	2,655,582.00		-	-
2	117.7	551,742.00	2,103,840.00	(112.3-105.7)/105.7 x c =	34,451.25	34,451.25
3	116.4	172,700.00	1,931,140.00	(117.7-105.7)/105.7 x c =	19,606.43	54,057.68
4	109.7	884,434.00	1,046,706.00	(116.4-105.7)/105.7 x c =	89,531.16	143,588.85
5	107.5	858,266.00	188,440.00	(109.7-105.7)/105.7 x c =	32,479.32	176,068.16
6		188,440.00	-	(107.5-105.7)/105.7 x c =	3,209.01	179,277.17
		6,280,000.00			179,277.17	

Adjustment made on the day after the 1st and every subsequent anniversary of the agreement

Appendix A – Sample of Fluctuation Clauses

A1. Sample clauses for Risk Proportion Approach

1. The interim payment and final payment shall include an adjustment in accordance with the provisions of this clause. The net total of such adjustments shall be used in determination of the final account.

2. For the purposes of this clause:-

   (a) the Consumer Price Index (CPI) shall be the Consumer Price Index (C) (or any specified index) published monthly by the Census and Statistics Department of the Government of Hong Kong.

   (b) "Base CPI Figure" shall mean the CPI figure (or any specified index) for the month in which the date for the return of the tender occurs.

   (c) "Current CPI Figure" shall mean the CPI figure (or any specified index) for the month in which the last day of the valuation period for the payment certificate occurs.

3. The increase or decrease in the sums otherwise payable in interim or final payment shall be dealt with as follows:

   (a) If the percentage difference between Current CPI Figure and Base CPI Figure does not exceed X%, then no adjustment of the interim payments and final payment shall be made.

   (b) If the percentage difference between Current CPI Figure and Base CPI Figure exceeds X%, the adjustment in respect of each payment certificate shall be calculated by multiplying the "Effective Value", "Proportion of Adjustable Items", "Net Change of CPI above threshold" and "Risk Sharing Proportion" together; where

      (I) The "Effective Value" shall be the difference between:

         (i) the amount which in the opinion of the Employer/Surveyor/Engineer is due to the Contractor under Clause XXX of the Conditions of Contract; and

         (ii) the amount calculated in accordance with (i) above in the last preceding interim certificate;

         provided that in the case of the first Interim Payment Certificate the Effective Value shall be the amount calculated in accordance with (i) above.

      (II) The "Proportion of Adjustable Items" shall be the proportion of the "Effective Value" which, as stipulated in the contract, shall be subject to price adjustment.

      (III) The "Net Change of CPI above threshold" shall be

         (i) the fraction of which the numerator is the Current CPI Figure minus the Base CPI Figure and the denominator of which is the Base CPI Figure minus X% if the Current CPI Figure is greater than the Base CPI; or

(ii) the fraction of which the numerator is the Current CPI Figure minus the Base CPI Figure and the denominator of which is the Base CPI Figure plus X% if the Current CPI Figure is smaller than the Base CPI.

(IV) The "Risk-Sharing Proportion" is the proportion of risk associated with the fluctuation in prices to be borne by the Employer/Surveyor/Engineer as stipulated in the contract.

A2. Sample clauses for CAP Approach

1. The interim payment and final payment shall include an adjustment in accordance with the provisions of this clause. The net total of such adjustments shall be used in determination of the final account.

2. For the purposes of this clause:-

   (a) the Consumer Price Index (CPI) shall be the Consumer Price Index (C) (or any specified index) published monthly by the Census and Statistics Department of the Government of Hong Kong.

   (b) "Base CPI Figure" shall mean the CPI figure (or any specified index) for the month in which the date for the return of the tender occurs.

   (c) "Current CPI Figure" shall mean the CPI figure (or any specified index) for the month in which the last day of the valuation period for the payment certificate occurs.

3. The increase or decrease in the sums otherwise payable in interim or final payment shall be dealt with as follows:

   (a) If the percentage difference between Current CPI Figure and Base CPI Figure does not exceed X%, then no adjustment of the interim payments and final payment shall be made.

   (b) If the percentage difference between Current CPI Figure and Base CPI Figure exceeds X% but is less than Y%, the adjustment in respect of each payment certificate shall be calculated by multiplying the "Effective Value", "Proportion of Adjustable Items", "Net Change of CPI above threshold" and "Risk Sharing Proportion" together; where

      (I) The "Effective Value" shall be the difference between:

         (i) the amount which in the opinion of the Employer/Surveyor/Engineer is due to the Contractor under Clause XXX of the Conditions of Contract; and

         (ii) the amount calculated in accordance with (i) above in the last preceding interim certificate;

      provided that in the case of the first Interim Payment Certificate the Effective Value shall be the amount calculated in accordance with (i) above.

(II) The "Proportion of Adjustable Items" shall be the proportion of the "Effective Value" which, as stipulated in the contract, shall be subject to price adjustment.

(III) The "Net Change of CPI above threshold" shall be

(i) the fraction of which the numerator is the Current CPI Figure minus the Base CPI Figure and the denominator of which is the Base CPI Figure minus X% if the Current CPI Figure is greater than the Base CPI; or

(ii) the fraction of which the numerator is the Current CPI Figure minus the Base CPI Figure and the denominator of which is the Base CPI Figure plus X% if the Current CPI Figure is smaller than the Base CPI.

(IV) The "Risk-Sharing Proportion" is the proportion of risk associated with the fluctuation in prices to be borne by the Employer/Surveyor/Engineer as stipulated in the contract.

(In a case where the risk above the CAP is borne by the Contractor)

(c) If the percentage difference between Current CPI Figure and Base CPI Figure exceeds or is equal to Y%, the adjustment in respect of each payment certificate shall be calculated by the same method as stipulated in (b) above, except that:-

(I) The "Net Change of CPI above threshold" shall be taken as:-

(i) Y% if the Current CPI Figure is greater than the Base CPI, or
(ii) -Y% if the Current CPI Figure is smaller than the Base CPI.

(In a case where the risk above the CAP is borne by the Employer)

(c) If the percentage difference between Current CPI Figure and Base CPI Figure exceeds or is equal to Y%, the adjustment in respect of each payment certificate shall be calculated by the same method as stipulated in (b) above, except that: the Risk Sharing Proportion between the Employer/Surveyor/Engineer and the Contractor will be 100:0 for the Net Change of CPI above Y%.

A3. Sample clauses for Target Cost Approach

1. At the end of each Valuation Period the Employer/Surveyor/Engineer shall make adjustments to the Target Cost to take account of differences between the price paid by the Contractor for Specified elements in the Valuation Period and the estimated unit prices of the Specified elements used in the determination of the initial Target Cost (and identified in the Form of Tender), as follows.

The adjustment, if any, to the Target Cost in respect of each Specified Element shall be calculated as A x (C – B), where:

A = the planned consumption of the Specified Element for that Valuation Period identified in the Form of Tender, as the figure may be adjusted in accordance with Clause 2.

B = the estimated unit price used in the determination of the initial Target Cost (and identified in the Form of Tender)

C = the weighted average unit price paid by the Contractor in respect of that Specified Element during the Valuation Period.

The Target Cost shall be adjusted by the sum of the adjustments in respect of each of the Specified elements.

2. If a Variation or Value Engineering Modification involves an increase or reduction in the quantities of a Specified Element required for the Works, for the purposes of Clause 1 the Employer/Surveyor/Engineer shall adjust the planned consumption figures in any Valuation Periods for the Specified Element to reflect such increase or reduction, as he considers fair and reasonable taking into account the nature of the Variation or Value Engineering Modification.

A4. Sample clauses for PFF Approach

I. Civil Engineering, E&M, Building and Design and Build Contracts

The wordings of the fluctuation clause for the Civil Engineering, Building, and Design and Build contracts are as follows:

(1) The sum payable in any interim or final payment certificate certified by the Engineer as being due (other than sums due under this Clause) shall be increased or decreased in accordance with the provisions of this Clause if there shall be any changes in the Index Figures listed in the "Index Numbers of the Costs of Labour and Materials used in Public Sector Construction Projects (April 2003 = 100)"compiled by the Census and Statistics Department of the Government of the Hong Kong Special Administrative Region and applicable to those items included in the "Schedule of Proportions".

(2) The net total of such increases and decreases shall be given effect to in determining the Final Contract Sum.

(3) For the purpose of this Clause:

(a) "Index Figure" shall mean any Index Figure appropriate to sub-clause (1) of this Clause.
(b) "Base Index Figure" shall mean the appropriate Index Figure applicable to the date 42 days prior to the date for the return of tenders.
(c) "Current Index Figure" shall mean the appropriate Index Figure to be applied in respect of any interim or final payment certificate by the Engineer and shall be the appropriate Index Figure applicable to the date 42 days prior to:

(i) the due date (or extended date) for completion of the Works, or
(ii) the date of completion of the Works certified pursuant to Clause 53, or
(iii) the last day of the period to which the payment certificate relates, whichever is the earliest.

Provided that in respect of any work the value of which is included in any such certificate and which work forms part of a Section for which the due date (or extended date) for completion has passed without completion pursuant to Clause 53 being achieved, the Current Index

Figure shall be the Index Figure applicable to the date 42 days prior to the due date (or extended date) for completion of that Section.

(d) The "Effective Value" in respect of the Works or any Section thereof shall be the difference between:

(i) the sum, exclusive of any increases or decreases made in accordance with this Clause, which in the opinion of the Engineer is due to the Contractor under Clause 79, before deducting retention and before deducting previous payments on account, less all sums in respect of Nominated Sub-contractors including profit thereon and items based on actual cost or current prices; and

(ii) the sum calculated in accordance with (i) above and included in the last preceding interim payment certificate issued by the Engineer.

Provided that in the case of the first certificate the Effective Value shall be the sum calculated in accordance with (i) above.

(4) The increase or decrease in the sums otherwise payable in an interim or final payment certificate pursuant to sub-clause (1) of this Clause shall be calculated by multiplying the Effective Value by a Price Fluctuation Factor which shall be the net sum of the products obtained by multiplying each of the calculated proportions given in column 4 of the "Schedule of Proportions" by a fraction the numerator of which is the relevant Current Index Figure minus the relevant Base Index Figure and the denominator of which is the relevant Base Index Figure.

Provided that if any appropriate Current Index Figure has not been published at the time of issue of any payment certificate, the increase or decrease in the sum payable in respect of that certificate will be provisionally calculated and added to or deducted from the sum payable in the certificate by the Engineer using the latest published Current Index Figure and shall be corrected in the next Engineer's certificate following the publishing of the relevant Current Index Figure.

(5) The "Schedule of Proportions" shall (irrespective of the actual constituents of the work) be "the Schedule of Proportions to be used in calculating the Price Fluctuation Factor" submitted with the Tender and with the calculations duly completed.

II. Term Contracts for Civil Engineering Works

The fluctuation clause for the term contracts for the civil engineering works is similar to the one in **I** above, except the words "interim or" is omitted in the first sub-clause (1) and an additional sub-clause (6) to exclude the applicability of the CPFS to interim payment certificate is included:

(6) The provisions of this Clause shall not apply to interim payment certificate issued by the Engineer pursuant to Clause 79.

III. Building Capital Works Contracts with Nominated Sub-contract for Electrical Installation

The fluctuation clause provided under the standard form of building contracts stipulates that the Effective Value shall exclude any payments to nominated sub-contractors (refers Clause 3(d)(i) in **I** above). This implies that CPFS is not applicable to nominated sub-contracts (NSC). ETWB TCW No.21/2003 has allowed a clause in the Special Conditions of Contract to deal with fluctuation adjustment with regard to NSC for electrical installation. It also mentions that unless under exceptional circumstances, NSC other than that for electrical installation shall have no provision for contract price fluctuation adjustment and that if such exceptional circumstances arise, a further SCC or an amendment of the standard SCCs will be required.

The essence of the fluctuation adjustment for the NSC for electrical installation is on the cost of labour. It uses the Index of Average Daily Wages of Workers Engaged in Public Sector Construction Projects (the "Wage Index") compiled by the Census and Statistics Department as a base. If the difference between the Wage Index at any valuation period and the Wage Index at the tender submission month is less than 5% then no adjustment is applicable. If the difference is greater than 5%, then the Employer shall pay to the Contractor or the Contractor shall allow to the Employer, as the case may be, the following adjustment:

"for each and every workman properly and necessarily employed by the Nominated Sub-contractors on the Site or in connection with the Sub-contract Works, the sum, calculated at the rate of twenty cents per day during the period to which new Wage Index relates in which the workman was so employed, for each unit figure of the Wage Index by which the increase or decrease in the Wage Index figure for the trade in which the workman is employed shall exceed five per cent."

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Appendix B – List of Major Indices for Labour and Materials

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Labour Indices

Index	Referred Elements	Source	Website	Frequency of Publication	Lagging
Average Daily Wages of Workers Engaged in Public Sector Construction Projects as Reported by Main Contractors	General worker, Concreter, Bricklayer, Drainlayer, Mason, Bar bender and fixer, Metal worker, General welder, Carpenter (formwork), Joiner, Plumber, Construction plant mechanic, Plasterer, Glazier, Painter and decorator, Plant & equipment operator (load shifting), Truck driver, Rock-breaking driller, Bamboo scaffolder, Structural steel erector, Diver, Leveller, Marble worker, Structural steel welder, Rigger/metal formwork erector, Asphalter (road construction), Electrical fitter (incl. electrician), Mechanical fitter, Refrigeration/AC/ventilation mechanic, Fire services mechanic, Lift and escalator mechanic, Building services maintenance mechanic, Cable jointer (power)	Census and Statistics Department	http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?charsetID=1&tableID=029	Monthly	3 months
Index Numbers of the Costs of Labour and Materials Used in Public Sector Construction Projects (April 2003 = 100) Cost of Labour Index	Composite Labour	Census and Statistics Department	http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?charsetID=1&tableID=112	Monthly	3 months

Material Indices

Index	Referred Elements	Source	Website	Frequency of Publication	Lagging
Index Numbers of the Costs of Labour and Materials Used in Public Sector Construction Projects (April 2003 = 100) Cost of Materials Index	Aggregates, Bitumen, Concrete blocks, Diesel fuel, Glass, Glazed ceramic wall tiles, Hardwood, Homogeneous floor tiles, Galvanised mild steel, Metal formwork, Mosaic tiles, Paint, Portland cement (ordinary), Sand, Steel reinforcement, Teak, Timber formwork, uPVC-lined GMS pipes, uPVC pipes, GMS pipes, Copper pipes	Census and Statistics Department	http://www.censtatd.gov.hk/hong_kong_statistics/statistical_tables/index.jsp?charsetID=1&tableID=113	Monthly	3 months
Cash Buyer Price for Copper Grade A	Grade A Copper	London Metal Exchange	http://www.lme.com/copper.asp	Daily	Nil