Hutchison Telephone Company Limited

Response to the Consultation Paper dated 2 May 2018 on "Arrangements for Assignment of the Spectrum in the 3.4 – 3.6 GHz Band for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee"

Date: 13 June 2018

I. Introduction

1. Hutchison Telephone Company Limited ("**Hutchison**") makes this submission in response to the consultation paper on "Arrangements for Assignment of the Spectrum in the 3.4 – 3.6 GHz Band for the Provision of Public Mobile Services and the Related Spectrum Utilisation Fee" ("**Consultation Paper**") jointly issued by the Communications Authority ("**CA**") and the Secretary for Commerce and Economic Development ("**SCED**") on 2 May 2018[1].

2. On 28 March 2018, the CA issued a statement entitled "Change in the Allocation of the 3.4 – 3.7 GHz Band from Fixed Satellite Service to Mobile Service" (the "**Statement**") promulgating its decision to change the allocation of the 3.4 – 3.7 GHz band from fixed satellite service ("**FSS**") (space-to-Earth) to mobile service for the provision of public mobile services in Hong Kong with effect from 1 April 2020.

3. We welcome the CA's decision to re-allocate the 3.4 – 3.6 GHz band ("**3.5 GHz band**") from FSS to public mobile services. However, we have great concerns over the CA's decision to impose restriction zones in Tai Po Industrial Estate and Stanley constraining the deployment of mobile base stations of public mobile services operating in the 3.5 GHz band in order to protect TT&C Stations (as defined below).

4. In Part II of this submission, we highlight and explain our views concerning the restriction zones. Part III contains our answers to the specific questions raised in the Consultation Paper.

II. Concerns over Restriction Zones

Background

5. Satellite operators set up earth stations for telemetry, tracking and control ("**TT&C**") of their satellites in orbit ("**TT&C Stations**") in Tai Po Industrial Estate and Stanley. According to the Statement, the CA has decided to impose restriction zones in Tai Po Industrial Estate and Stanley to constraint the deployment of mobile base stations of public mobile services operating in the 3.5 GHz band, so as to protect the existing TT&C Stations from harmful interference.

6. It is stated under Paragraph 26 of the Statement that:

> "To reduce impact on TT&C Stations arising from the re-allocation, local satellite operators who have the necessary technical expertise and resources should implement appropriate mitigating measures. As an additional safeguard

[1] The CA and the SCED are collectively referred to as "The Government".

for existing TT&C Stations, the CA has decided to impose restriction zones constraining the deployment of mobile base stations of public mobile services operating in the 3.4 – 3.6 GHz band. Details of the restriction zones are set out at Annex B."

Excessive Size of the Restriction Zones

7. We are totally stunned by the extensiveness of the restriction zones as shown in a map (reproduced below) under Paragraph 4 of Annex B (headed "Restriction Zones for Protection of the Telemetry, Tracking and Control Stations") of the Statement[2]. In Figure 1 below, the two restriction zones are depicted in pink color, with the one in Tai Po being denoted as Restriction Zone 1 (Z1) and Stanley as Restriction Zone 2 (Z2):

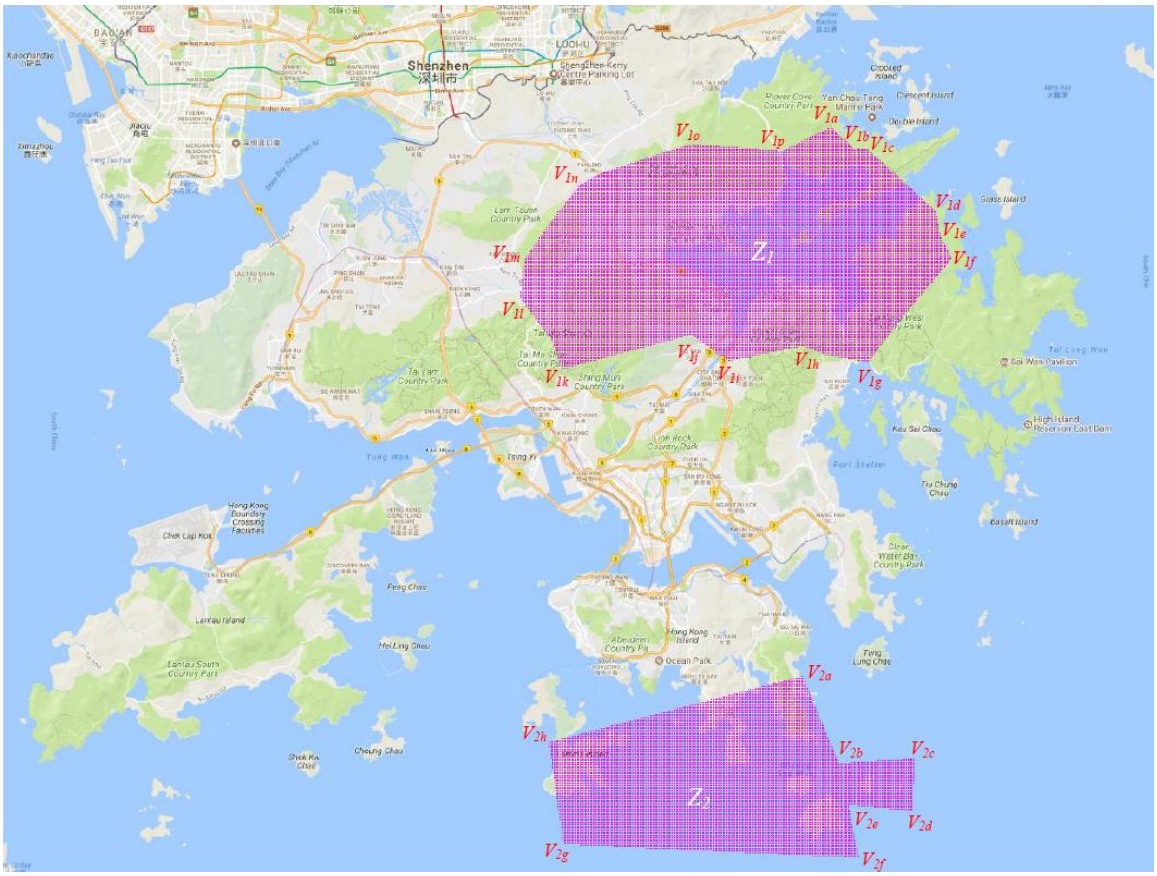

Figure 1: Restriction Zones to be implemented.

8. Unlike the TT&C Station in Stanley which is located in a relatively remote, restricted and isolated area, the TT&C Station in Tai Po Industrial Estate is located in an environment surrounded by offices and population. It is located just 1.5 kilometers from the Tai Po Town Centre and a few hundred of meters from the nearest housing

[2] Para. 4, Annex B of the Statement.

estates (Fu Shin Estate and surrounding villages), not to mention that the Tai Po Waterfront Park is situated right next to the Industrial Estate.

9. In neither the Statement nor the Consultation Paper had the Government listed out clearly the districts and population to be affected. Hence, the telecommunication industry, the media and the public could only make a rough estimate of the impacts on their own. We note from the pink area in Restriction Zone 1 that it covers not only Tai Po but also the entire Ma On Shan, part of Shatin (where The Chinese University of Hong Kong and the Hong Kong Science Park are located), Sai Kung and Fanling. It is estimated that more than one million population would be affected. As such, mobile users in these wide areas would be unfairly deprived of using 5G services over the 3.5 GHz band.

Restrictive use of 5G

10. As the prospective assignees are prohibited from setting up 5G-related radio base stations in the affected areas, we have great concerns over the size of the restriction zones, particularly Restriction Zone 1. From a technical perspective, it is apparent that the C-band (i.e. 3.5 GHz band) with its global harmonization has been commonly allocated as the most basic spectrum range for 5G application worldwide. The 3.5 GHz band could not be completely substituted by higher frequencies such as the 26 GHz and 28 GHz bands which are known not suitable for high-mobility application and building penetration. If only 26 GHz and 28 GHz bands will be deployed for 5G services in the affected areas, we foresee that indoor coverage will be detrimentally impacted and coverage on main roads and highways, such as in Tolo Highway, also a serious problem.

11. Moreover, the restriction zones will also affect machine-to-machine communications like Internet of Things made in the vicinity of the restriction zones. In view of the emerging 5G services, vendors and operators alike have been working on innovative applications. For instance, the high-speed and low-latency features of 5G could enable large numbers of public safety cameras streaming in high definition in Hong Kong. These smart city applications play an essential role in achieving the Government's goal of making Hong Kong a world class smart city. Nonetheless, the restriction zones would undoubtedly hinder such development.

Technical Viewpoints

12. The CA stated under Paragraph 2 of Annex B to the Statement that "The necessary spatial separations between TT&C Stations and mobile base stations in different directions, i.e. the restriction zones, are devised to prevent de-sensitisation of satellite receivers caused by in-band signals of the public mobile services in the 3.4 – 3.6 GHz band [1], taking into account the actual terrain, clutters, buildings in the surrounding areas and deployment of base stations over the years, among others."

13. Hutchison has studied in particular the technical aspects set out in Annex B with a telecommunications equipment vendor, and we have the following observations:

- spatial separations between TT&C Stations and mobile base stations appear to be the only mitigating measures proposed by the CA, whilst implementation of appropriate mitigating measures on the TT&C Stations by the local satellite operators themselves are missing;

- some technical parameters used in the computer simulations as referred to at Annex B may not reflect the mobile base stations deployment in the real situations;

- as a result, the restriction zones imposed are considered to be unnecessarily large, i.e. equivalent radius is around 9 km and 5 km for Restriction Zone 1 (Tai Po Industrial Estate) and Restriction Zone 2 (Stanley), respectively.

Additional Mitigating Measures

14. We consider that additional to the spatial separations as stated at Annex B, there are other appropriate mitigating measures which could be useful to further increase the isolation between the in–band operations on the TT&C Stations and mobile base stations, which in turn help reduce the size of the restriction zones.

15. In this respect, Hutchison, together with the other three mobile network operators ("**MNOs**")[3], submitted a joint letter to the Office of Communications Authority ("**OFCA**") on 24 May 2018 setting out our technical viewpoints and a number of feasible mitigating measures for OFCA to consider, which include:

(1) adding shielding covers for the TT&C Stations;
(2) optimizing the radiation directions of mobile base station antennas; and
(3) relocation of the TT&C Stations from Tai Po to other remote area.

16. Regarding the shielding covers for the TT&C Stations, we noted that the TT&C Station antennas described in Annex B have a very narrow radiation beamwidth, i.e. large gain at the boresight and sharp roll-off at off axial directions. We opine that by adding an appropriate shielding cover to the dish antenna of the TT&C Station so as to:

- pass all signals with an angle of incidence within its main lobe's beamwidth, e.g. within the range of -48 ~ 48 degree; and
- block all signals with an angle of incidence out of its main lobe's beamwidth, e.g. within the range of -180 ~ -48 degree and 48 ~ 180 degree;

[3] The other three mobile network operators are China Mobile Hong Kong Company Limited, Hong Kong Telecommunications (HKT) Limited and SmarTone Mobile Communications Limited.

the composite in-band interference signals received at the dish antennas of the TT&C Station would hugely be reduced, whereas the reception of the weak TT&C signals in the 3.4 – 3.7 GHz band would not be deteriorated.

This mitigating measure is expected to increase isolation between the TT&C Stations and mobile base stations by more than 20 dB, meaning that the required spatial separations between TT&C Stations and mobile base stations would be much smaller than that imposed at Annex B to the Statement.

17. At Annex B, it is estimated that the technical parameters G_{satm} (gain of dish antenna at earth station, towards the mth interfering mobile base station) are as follows:

- Some mobile base stations: G_{satm} is from -10 dB to 32 dB (conforming to Rec. ITU-R S.465-6)
- Other mobile base stations: G_{satm} = -10 dB

Due to the characteristics of the TT&C Station antennas on gain pattern and boresight in uptilt angle facing towards the satellites in the sky, we opine that it is feasible to optimize the radiation directions of the mobile base station antennas near the TT&C Stations by not aligning the mobile antennas with the TT&C Station antennas, so as to maintain the technical parameter (G_{satm}) at -10 dB. This mitigating measure is expected to increase isolation between the TT&C Stations and mobile base stations by more than 10 dB.

18. On relocation of the TT&C Station from Tai Po to other remote area, Hutchison indeed proposed this option to the CA on 7 September 2017 in its response to the consultation on "Proposed Change in the Allocation of the 3.4 – 3.7 GHz Band from Fixed Satellite Service to Mobile Service". Considering the size of Restriction Zone 1, the surrounding population, the duration of 3.5 GHz band black-out period (i.e. expected to be 15 years), we would like to reiterate that relocating the existing TT&C Station from Tai Po to other remote area is the only long-term, viable solution to enable 3.5 GHz band to be used as a complete 5G coverage solution for Hong Kong.

Spectrum Utilization Status

19. In the aforesaid joint letter, the MNOs also urge OFCA to disclose information on the current frequency and usage of TT&C channels operating in the 3.5 GHz band for our further study. If the current usage is found to be concentrated on specific channels, the MNOs may be able to devise additional mitigating measures to further reduce the size and boundary of the restriction zones.

20. We noted from Paragraph 30 of the Consultation Paper that the CA requires spectrum assignees of the Frequency Block A1 to take reasonable measures to install, maintain and operate the service and the network, and in particular the operation of the radio channel overlapping with the 3.400 – 3.405 MHz range, to avoid causing any harmful

interference to the operation of that TT&C channel in the restriction zones. In this respect, we opine that OFCA should specify the level of protection to TT&C channel required quantitatively and as early as possible (before the CA announces its decision by the end of 2018). Otherwise, such uncertainty over the utilization of Block A1 for 5G deployment would adversely affect MNOs' decision on bidding the concerned spectrum block.

Win-Win Approach

21. We are aware that the CA has considered the industry feedback collected at the Radio Spectrum and Technical Standards Advisory Committee and its own technical consultant in devising the restriction zones. However, we believe that more need to be done on this critically important issue. Hutchison is ready to offer assistance on any technical discussion and trials to explore more feasible mitigating options, if necessary.

22. We urge the CA to consider seriously our proposed additional mitigating measures as set out in the aforesaid joint letter and re-devise the restriction zones urgently, so as to facilitate the mobile industry to better utilize the 3.5 GHz band for 5G mobile network deployment and services provisioning. The reduction in the size of the restriction zones is fundamental to bringing Hong Kong a step closer toward a world class smart city and leader of 5G technology. The CA should endeavor to minimize the affected population to a very low single-digit percentage.

23. We maintain our view that OFCA should take the lead on arranging a series of meetings with the stakeholders from both the mobile and satellite industries for the purpose of devising a set of effective, feasible and mutually agreed mitigating measures, as well as ironing out the differences between the two industries via regulatory and commercial means. Efforts should also be made to address the details of the implementation of the mitigating measures, including the technical requirements and specifications of converter and filter, shielding structure to be installed by fixed satellite operators, etc., for the benefits of the general public in Hong Kong.

Long Term Policy

24. We found that the imposition of large areas of restriction zones to constraint the deployment of mobile base stations of 5G services is unique in Hong Kong, detrimental to the interests of many mobile users in the affected areas. We wonder whether this would be a temporary measure until the expiry of the licenses held by satellite operators. In view of the world trend in the use of the 3.5 GHz band, we suggest that the Government should make the necessary arrangements to move the fixed satellite services to bands higher than the 3.4 – 4.2 GHz band as a long term spectrum policy.

III. Response to the Specific Questions in the Consultation Paper

Question 1:	Do you have any views on assigning the spectrum in the 3.5 GHz band through an auction?

1. Considering the characteristics of 5G technology (which demands for more and wider frequency spectrum than 4G LTE), the number of MNOs and the size of Hong Kong, we are of the view that the amount of spectrum per MNO is inadequate for providing superb network speed and quality user experience. Hence, assignment priority should be given to the existing MNOs.

Question 2:	Do you have any views on the proposed band plan with division of the available spectrum into ten frequency blocks, each with a bandwidth of 20 MHz?

2. We propose that the band plan be divided into 20 frequency blocks, each with a bandwidth of 10 MHz, to increase flexibility for the following reasons:

   (1) In December 2017, the 3rd Generation Partnership Project ("**3GPP**"), a consortium of industry associations and standard organizations, approved the first standard for the Non-Standalone (NSA) 5G New Radio (NR) at the RAN Plenary Meeting (3GPP RAN#78) held in Lisbon, Portugal. The 3GPP's 5G standard approval set the stage for the global mobile industry to start full speed development of 5G NR for large-scale trials and commercial deployment as early as in 2019.

   We note that the channel bandwidths in the 3.5 GHz band range from 10 MHz up to 100 MHz[4]. For the deployment of 5G network in the 3.5 GHz band, there is a range of carrier bandwidths, namely 10 MHz, 15 MHz, 20 MHz, 30 MHz, 40 MHz, 50 MHz, 60 MHz, 70 MHz, 80 MHz, 90 MHz and 100 MHz.

   With reference to the range of carrier bandwidths, however, the proposed band plan (i.e. dividing 200 MHz into ten frequency blocks with each block having a bandwidth of 20 MHz) will not be able to cater for 10 MHz, 15 MHz, 30 MHz, 50 MHz, 70 MHz, and 90 MHz scenarios.

[4] Please see https://3gpp.org for the specifications. Also refer to 3GPP TS 38.104 V15.1.0 (2018-03).

(2) The recent auction of 3.4 GHz band held in the United Kingdom in April 2018 adopted a band plan based on a block size of 5 MHz[5], whereas a 3.5GHz spectrum auction to be held in June this year in South Korea has adopted a band plan based on a block size of 10 MHz.

(3) In view of the uncertainty over Frequency Block A1 (please refer to Paragraph 19 of Part II above for details), a smaller frequency block with a bandwidth of 10 MHz would help minimize the adverse impact on prospective assignees.

Question 3:	Do you have any views on the proposed spectrum cap of 100 MHz to be imposed on any bidder in the auction?

3. Given that the spectrum available for auction is limited, we consider that it would be appropriate to set a spectrum cap at 70 MHz, so as to prevent any operator from acquiring more than 35% of the available spectrum. Further, setting a spectrum cap below 100 MHz would avoid from dominating the 5G mobile markets by only two deep-pocketed investors, thereby maintaining a level playing field, multi-players environment and healthy competitions in the Hong Kong telecommunications market.

Question 4:	Do you have any views on the proposed format of and timing for the auction?

4. **Proposed format**

We generally agree with the proposed format, i.e. a clock auction format, followed by an assignment stage, to ensure that contiguous frequency blocks in the 3.5 GHz band can be assigned to successful bidders. However, we would like to seek clarification from the CA regarding the bidding mechanism.

It is stated under Paragraph 23 of the Consultation Paper that "Bidding will take place over a number of rounds, with the round price increasing in each round in which the demand from bidders exceeds the available supply, *until the total demand for frequency blocks from all bidders is equal to* ***or less than the total supply***." [emphasis added]. It is unclear from the said Paragraph 23 that how the remaining supply would be handled under a scenario where a round of bidding stops when the

[5] Please see https://www.ofcom.org.uk/spectrum/spectrum-management/spectrum-awards/awards-archive/2-3-and-3-4-ghz-auction.

total demand is *less than* the total supply. We wonder whether the remaining block(s) would be dealt with at the same auction or be made available for bidding at a later stage after the completion of the 3.5 GHz band auction. Hence, we would like to seek clarification from the CA in this respect.

Timing for the auction

Considering that Shenzhen has been selected by the Mainland authorities to carry out 5G technical trials with C-band since 2016, we suggest that OFCA should closely monitor the status of 5G deployment in Shenzhen over the 3.5 GHz band, particularly the timeline, locations, scopes, and configuration requirements, as it is likely that Shenzhen will have C-band 5G network deployment earlier than 2020 and may cause undesirable interference to FSS in Hong Kong. In this connection, we wonder whether the CA has considered this issue and coordinated with the Mainland authorities to avoid such potential interference along the border or even over to Restriction Zones given the possibility of strong 3.5 GHz band signal overspill from the Mainland, especially from the sites on higher ground in the areas surrounding Hong Kong.

Question 5:	Do you have any views on the proposed ONA requirement?

5. We have no adverse comment on the proposed ONA requirement.

We noted that when the 1.9 – 2.2 GHz band were assigned in 2001 the four incumbent mobile licensees were required to fulfil the ONA requirement by opening up 30% of the capacity of their 3G network for use by non-affiliated service providers. When the 3G spectrum was re-assigned in 2016, the spectrum assignees were not subject to any ONA requirement. During the 15 years when the ONA was implemented, OFCA took a light-handed approach to managing the ONA framework, which was proven effective. So far, we are not aware of any case that a MNO or a mobile virtual network operator ("**MVNO**") required intervention from OFCA to resolve disputes over access. In the premises, we consider that OFCA should take a similar approach to governing the ONA regulatory regime and let the relevant parties to handle the access issues via commercial means.

Question 6:	Do you have any views on the proposed requirements as set out in paragraphs 29 to 31 above?

6. Please refer to Part II – Concerns over Restriction Zones of our submission above for details.

Question 7:	Do you have any views on the proposed subsidy scheme for the upgrade of existing SMATV systems, including the funding and administrative arrangements for issuing the amount of subsidies to the affected system owners/users?

7. Regarding the proposed subsidy scheme for the upgrade of existing SMATV systems, we only agree with the criteria set out under Paragraph 34 of the Consultation Paper concerning the applications and timeframe for the subsidy. We do not agree with the funding and the administrative arrangements as set out in Paragraphs 33 and 35 of the Consultation Paper.

The CA proposed that the prospective spectrum assignees shall jointly set up and administer a fund for the purpose of subsidizing the upgrade of eligible SMATV systems. We consider such proposal unreasonable.

Considering the amount of spectrum utilization fees ("**SUF**") to be collected by the Government through the upcoming 3.5 GHz band auction and the annual license fees payable by licence holders into the OFCA Trading Fund, we are of the view that the funding should be taken from the SUF or the OFCA Trading Fund. Under section 3 of the Trading Funds Ordinance, Cap. 430 ("**TFO**"), it was stated that the trading fund is to manage and account for the operation of government service for which the "Government has the financial objective that the service shall fund itself from the income generated from the government service." We are aware that as of 2017 the development reserve of the OFCA Trading Fund amounts to about HK$690 million.

According to the CA, SMATV are licensed systems. We do not see any reason why prospective assignees would be appropriate to administer the subsidy scheme for these licensed systems. In the Consultation Paper, the CA set out the administrative works which include handling of applications from eligible applicants for subsidy and issuing subsidies to eligible applicants. We believe, OFCA who has the proper records of the 1,600 existing SMATV systems (which are serving some 890,000 outlets) and experience in working with different licensees, should be the legitmate authority to take up this regulatory role.

Question 8:	Do you have any views on the adoption of a technology neutral approach in respect of the use of spectrum in the 3.5 GHz band?

8. We support the adoption of a technology neutral approach in respect of the use of spectrum in the 3.5 GHz band by the CA for mobile communications, not for FSS.

Question 9:	Do you have any views on the proposed network and service rollout obligations, as well as the associated performance bond to be imposed on successful bidders?

9. We generally agree with the proposed network and service rollout obligations, subject to the definition of what constitutes "50% of the population".

The CA proposed in the Consultation Paper that each successfully bidder is required to "roll out its network and service in order to provide a minimum coverage of 50% of the population with regard to its mobile services within the first five years counting from the date of issue of the licence." Considering the size of the Restriction Zones 1 and 2, we are of the view that the population in Restriction Zones 1 and 2 should be excluded from counting toward the "50% of the population" in Hong Kong. Also, the population coverage should refer to outdoor only. In this connection, we urge the Government to list out the districts and population to be affected and disclose such information to the public as soon as possible.

For the associated performance bond, we agree with the proposal that incumbent licensees may make use of its existing network to fulfill the proposed network rollout requirement.

Question 10:	Do you have any views on the proposals in relation to SUF above?

10. We support the proposition that prospective licensees should be given an option to pay the SUF either by lump sum payment upfront or by annual instalments.

With regard to the level of the SUF, we are of the view that SCED should not set the SUF at a high level. Studies have shown that extracting too high a price for SUF would be counterproductive, resulting in reduced investment and higher consumer prices[6]. SCED should instead take a conservative approach based on economic efficiency to choosing the right spectrum price. As the CA has proposed to take the market-based approach to making available the spectrum for auction, the reserve price should be set at a minimal level. Letting the market decide on its appropriate price level is in line with the market-based approach adopted by the CA. Reference can be made to the recent 5G auction (3.4 GHz) held in the United Kingdom and other jurisdictions for setting a reasonable reserve price.

- The End -

[6] *"The Need for a Conservative Approach to the Pricing of Radio Spectrum and the Renewal of Radio Spectrum Licences"*, by Dr. Chris Doyle, Apex Economics, 14 December 2010.