

The Valuation Effects of a Nation's External Wealth: Concepts and Measurements

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Abstract This paper discusses the concepts and measurements of valuation effects of a nation's external wealth, which has become an important research focus in light of the deepening globalization. Further, it clarified the connections and heterogeneity between valuation effects and three related concepts, *dark matter*, *excess return* and *financial adjustment*, under a uniform theoretical model. It argues that although closely related, these concepts are different in definitions and measurements and the misuse of them in recent research has led to misunderstanding, ambiguity, and confusion. The detailed analysis in this paper will benefit the subsequent academic and policy research by solidifying the conceptual framework in the field of studies.

Keywords: valuation effects, dark matter, excess return, financial adjustment

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1. Introduction

Since the 1990s, deepening economic globalization and financial integration, more and more countries have been holding cross-border assets and liabilities, accompanied by increasingly frequent international wealth transfer. Those shifts has led to volatile exchange rates and asset prices, which, in turn, bring substantial impact on the market value of net foreign assets. Under this background, when measuring the change of a nation's external wealth, it is necessary to count in those resulted from the Valuation Effects, which describes the changes in the market value of foreign assets and liabilities, in addition to those resulted from trade flows.

Valuation Effects was first discussed by Lane and Milesi-Ferretti [1,2], who assessed the external wealth of 67 countries and regions from 1970 to 1998 using the Balance of Payments (BOP) and the International Investment Position (IIP) data. Inconsistent with the traditional theories of the intertemporal approach to the current account [3], they found significant gaps between changes in net foreign assets and current account balances in various countries and argued that it is the changes in the market value of net foreign assets caused by exchange rate and asset price fluctuations, namely *Valuation Effects*, which is not captured in the BOP statistics, that leads to the discrepancies.

Increasingly significant impact of valuation effects on external wealth, resulted from ever-larger scale of foreign

assets and liabilities has attracted the interest of many scholars. Meanwhile, other terms were coined by economists when discussing the changes in external wealth that cannot be captured by current-account-transactions. For example, Hausmann and Sturzenegger [4] described the difference between net foreign assets and cumulated current account as *Dark Matter*, because they truly exist but are unobservable in the accounting framework; Lane and Milesi-Ferretti [5] used *Excess Return* when explaining the exorbitant privileges the United States enjoyed in external transactions; Gourinchas and Rey [6] adopted *Financial Adjustment*, contrasting trade adjustment, to describe the impact of international financial conditions, such as exchange rate and asset prices, on the external imbalances adjustment.

The above-mentioned terms, dark matter, excess return, and financial adjustment, are all closely related to valuation effects. Many economists even use them interchangeably in different contexts, as if they are a person's name in different languages [7]. However, these concepts do not represent the same economic phenomenon and inconsistent usages may lead to confusion and serious mis-understanding. Unfortunately, although many recent theoretical and empirical studies advanced the research on valuation effects, few explained in detail and in depth the similarities and differences between valuation effects and other related concepts.

This paper adds the missing part of literature by clearly defining and measuring valuation effects, dark matter, excess return, and financial adjustment, which provides a sound base to other applied research in the field of

external wealth transfer. The second section discusses the definition of valuation effects, the following three sections compares valuation effects with dark matter, excess return, and financial adjustment, respectively, and the last section concludes the paper.

2. Valuation Effects

Valuation effects refers to the changes in net international investment positions (net foreign assets) caused by exchange rates and asset prices when the scale and structure of international investment were held constant. In theory, valuation effects are measured by subtracting an economy's current account balance from the change in net foreign assets. However, in practice calculations based on BOP data also needs to deal with other discrepancies, such as inconsistent statistical standards and data omissions and errors.

According to Lane and Milesi-Ferretti [8], changes in net foreign assets can be decomposed into current account balance CA_t , capital account balance KA_t , capital gain KG_t , other changes OC_t , and omissions and errors EO_t :

$$NFA_t - NFA_{t-1} = CA_t + KA_t + KG_t + OC_t + EO_t \quad (1)$$

Capital gain, which reflects the changes in the market value of net foreign assets due to exchange rate and asset price fluctuations, is part of valuation effects, while existing literature disagrees on whether other changes, OC_t , is also part of valuation effects. We summarize from previous studies three ways to treat other changes when calculating valuation effects: 1) treat it as a residual item and thus include it in valuation effects, 2) treat it data errors caused by inconsistent statistical standards and thus exclude it from valuation effects, and 3) include part it in valuation effects based on further decomposition [9,10]. A detailed description of each treatment is listed as follows.

Early studies often count OC_t as part of valuation effects. According to this treatment, overall valuation effects includes capital gain and other changes, which in turn leads to larger calculated valuation effects compared to those calculated under other treatments. Since there didn't exist any perfect measurement of valuation effects in the previous literature, most of economists got used to take the excess return as the proxy of valuation effects, and found there is an upwards bias. For instance, Gourinchas and Rey [11] found that between 1952 and 2004, the United States enjoyed an average annual real actual excess return of 2.1%; Lane and Milesi-Ferretti [5] found that between 1980 and 2004, the actual excess return is as high as 3.9%; Obstfeld and Rogoff [12] and Meissner and Taylor [13] also measured excess returns in the United States during the same period (1983-2003 and 1981-2003), and obtained similar results (3.1% and 3.7%, respectively).

After the 2008 Global Financial Crisis, many papers started to reflect on the treatment of including OC_t as valuation effects because it overestimates the scale of valuation effects. These studies treat OC_t as resulted from data errors or inconsistent statistical standards and therefore should be excluded from valuation effects. With

this treatment, Lane and Milesi-Ferretti [14] found the excess return rate of the United States from 1983 to 2007 is only 0.6%, Curcuro et al [15] found that there was no significant excess return of the United States from 1990 to 2005, and Curcuro et al [9] found that even considering the driving effect of FDI, the excess return rate is only 1.9%, relying on data from 1990 to 2011.

The treatment decomposes OC_t into various parts. Those classified as errors are excluded from valuation effects while other parts are included. Results calculated with this treatment, about 0.5% for valuation effects and 1.7% for excess return rates in [16], are in between the calculations under the two above-mentioned treatment. With similar methodology, Gourinchas et al [17] estimated that the US excess return rate from 1973 to 2009 was 1.6%, similar to the calculations in [16].

3. Valuation Effects and Dark Matter

Hausmann and Sturzenegger [4] also found the inconsistency between current account balance and the changes in net foreign assets when studying the persistent external imbalances of the United States. Borrowing from the Law of Conservation of the Universe in physics, they named the difference *dark matter*. Many scholars regard dark matter and valuation effects as the same thing [20], but in fact the two concepts are different in both definitions and calculating methods.

The concept of dark matter, in international economics, was coined later than valuation effects and Hausmann and Sturzenegger [18] did not use the concept of valuation effects in their studies because they believed exchange rate changes and asset price fluctuations can only explain part of the discrepancies between current account balances and changes in net foreign assets. They did agree that changes in exchange rates, given different currency composition of foreign assets and liabilities, will lead to changes in the valuation of net foreign assets. However, they cannot fully explain the persistent discrepancies of developed countries, such as the United States, because the exchange rate dynamics of their currencies are usually lack of monotonic trends and are of short cycles. Therefore, the concept of dark matter, namely the discrepancies, go beyond valuation effects.

Hausmann and Sturzenegger [19] argues that dark matter are mainly resulted from statistical omissions and errors in official data based on the following paradox. According to official data, foreign assets of United States are of a smaller scale than external liabilities, which means the United States is a debtor relative to the world. Thus the Net Investment Income should have be negative, that is, the total investment income is less than the interest paid to other countries. However, the fact is that the net interest income of the US has remains positive in the 25 years through 2005. Their believed this paradox indicated that the actual foreign assets of the US are of a larger scale than foreign liabilities, but part of the assets are not captured by official IIP data, overestimating the net liabilities of the US. They attribute the omitted or undervalued foreign assets as the main component of dark matter.

As the leader of the international monetary and financial system, the US enjoys at least three sets of spillover effects when making external investment: the seigniorage brought by the US dollar as an international reserve currency, credit enhancement because it provides “safe assets” to the world, and advanced technology and management methodologies accompanying FDIs [21]. These are all invisible foreign assets of the United States, but their value is often not captured by official IIP statistics, leading towards dark matter.

Concepts aside, the methods of calculating valuation effects and dark matter are also different. The calculation of dark matter first estimates the total level of net foreign assets, both invisible and visible, by dividing net investment income by a reasonable discount rate, and then subtracting the official value of net foreign assets from the estimated total value, as is described by Equation (2):

$$DM = NFA^{DM} - NFA = \frac{NII}{r} - NFA \quad (2)$$

where DM represents the level of dark matter in net foreign assets, NII represents the level of net investment income, NFA represents the official value of net foreign assets, and r represents the level of discount rate. We adopt 5% interest rate following [4] to capitalize income streams. Though it has been attacked as arbitrary, the essential point would still follow for any constant positive interest rate

Based on Equation (1) and Equation (2), cumulative valuation effects and dark matter of China from 1982 to 2018 were calculated using official BOP and IIP data in Figure 1. Both cumulative valuation effects and dark matter have remained negative since 1994, reflecting that China generally has weak profitability in its foreign investment. Before the turning point of 1994, dark matter was positive for most years, indicating that the actual net foreign asset level was higher than the official value and there was a positive return on net foreign investment. After 1994, the dark matter turned negative, and its absolute level has been of an increasing trend and has remained larger than that of accumulated valuation effects. This means that China’s foreign investment has suffered a larger loss after 1994 and the official net foreign assets has been overvalued. Meanwhile, the cumulative valuation effects has always been negative and it has been relatively stable around -10% of GDP.

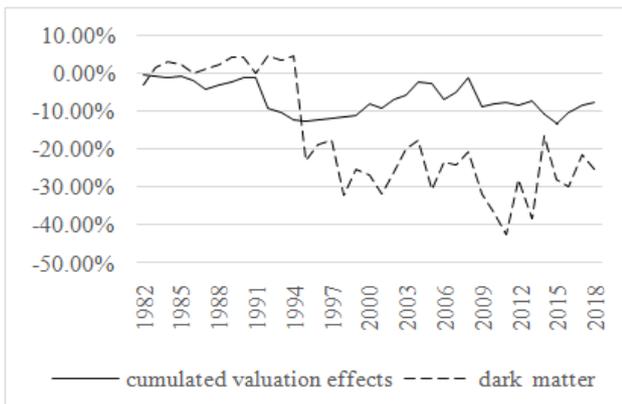


Figure 1. Comparison between cumulative valuation effects and dark matter of China

The above analysis shows that although valuation effects and dark matter are both coined to analyze the discrepancies between the changes in net foreign assets and current account balances, the two concepts differ significantly. Valuation effects link the discrepancies to exchange rate and asset price fluctuations, while the dark matter associate discrepancies with invisible or underestimated foreign assets. Careful considerations are required to make appropriate choices between the two concepts in academic research.

4. Valuation Effects and Excess Return

Excess return is a frequently mentioned concept in studies on valuation effects. For example, as is discussed above, many economists used the rate of excess return as a benchmark to determine whether other changes should be included in valuation effects. Excess return refers to the difference between return on foreign assets and interest on foreign liabilities in the international investment positions, which reflects the net income of a country’s foreign investment. Similarly, excess income is gained when the return on foreign assets is larger than interest on foreign liabilities while excess loss is recorded otherwise. Habib [22] indicated that excess return and valuation effects are different concepts that should not be used interchangeably through a case study, but he did not make detailed explanation regarding the definition and the measurement if the two concepts.

Equation (3) provides a starting point to clearly distinguish valuation effects from excess return. It further decomposes current account balance in Equation (1) into balance of trade in goods and services (GSB_t), unilateral transfer (UT_t), and investment income balance (IIB_t), relying on the Balance of Payment Identity:

$$NFA_t - NFA_{t-1} = GSB_t + UT_t + IIB_t + KA_t + KG_t + (OC_t + EO_t) \quad (3)$$

where investment income balance IIB_t and capital gain KG_t together constitute a country's gross return on net foreign assets portfolio. Under the current accounting practices of international transactions, investment income is recorded in the BOP as Primary Income (part of current account balances). On the contrary, capital gains, which belong to valuation effects, are not reflected in the BOP. Therefore, to calculate the excess return rate of a country, it is necessary to measure both the rate of investment income (yields) and rate of capital gain foreign assets, and add the two together to get gross returns:

$$i_t^A = \frac{IIB_t^A}{A_{t-1}}, \quad i_t^L = \frac{IIB_t^L}{L_{t-1}} \text{ (yield)} \quad (4)$$

$$k_t^J = \frac{KG_t^J}{J_{t-1}} = \frac{J_t - J_{t-1} - FA_t^J}{J_{t-1}}, \quad J = A, L \text{ (capital gain)} \quad (5)$$

$$r_t^J = \frac{IIB_t^J + KG_t^J}{J_{t-1}} = i_t^J + k_t^J, \quad J = A, L \text{ (gross return)} \quad (6)$$

where i_t^A and i_t^L represents the investment yield of foreign assets and liabilities respectively, which is equal to the

corresponding investment income flow (Π_t^A or Π_t^L) divided by the stock of foreign assets or liabilities at the end of the previous period (A_{t-1} or L_{t-1}). Similarly, k_t^A and k_t^L represents the rate of capital gain on foreign assets and liabilities, respectively, which equal the corresponding capital gain (KG_t^A or KG_t^L) divided by A_{t-1} or L_{t-1} . Capital gain is obtained by subtracting the capital outflows F^A (or capital inflow F^L) from the changes in foreign assets (or liabilities) at time t (namely, $KG_t^A = A - A_{t-1} - F_t^A$ and $KG_t^L = L - L_{t-1} - F_t^L$). Finally, as in Equation (6), the gross return on foreign assets and liabilities (r_t^A and r_t^L) is calculated by adding up the yield from the investment income (i_t^A or i_t^L) and the rate of capital gain (k_t^A or k_t^L). Based on these calculations, the excess return on net foreign assets, r_t , can be measured as

$$r_t = r_t^A - r_t^L = (i_t^A - i_t^L) + (k_t^A - k_t^L) = i_t + k_t \quad (7)$$

The above analysis shows that excess return and valuation effects are linked via capital gains, but are different concepts. For the ease of comparison, valuation effects can be standardized (divided by the GDP) as in Equation (8)

$$\begin{aligned} val_t &= \frac{KG_t}{GDP_t} = \frac{KG_t^A - KG_t^L}{GDP_t} \\ &= \frac{k_t^A A_{t-1} - k_t^L L_{t-1}}{GDP_t} = \frac{k_t^A a_{t-1} - k_t^L l_{t-1}}{1 + \gamma_t} \end{aligned} \quad (8)$$

where a_{t-1} and l_{t-1} represent the ratio of foreign assets and liabilities to GDP, respectively, at the end of time t , while γ_t stands for the GDP growth rate at time t . Equation (8) shows that the ratio of valuation effects to GDP is a function of the rate of capital gains (k_t^A or k_t^L), but is also affected by the ratios of foreign assets and liabilities to GDP and the GDP growth rate. In other words, valuation effects not only reflect the rate of capital gains, but also the scale of foreign assets and liabilities, which is subject to the *inertia* of the external wealth of a nation.

The following hypothetical case will help further illustrate the difference between the rate of capital gains and valuation effects. Suppose that the scales of foreign assets and liabilities of an economy are both 100. Half of foreign assets are denominated in foreign currencies while all foreign liabilities are denominated in local currency. With this structure, if the foreign currency appreciates by 10% relative to the domestic currency, the return on foreign assets will increase by 5% while the interest on foreign liabilities will remain unchanged. Therefore, the rate of capital gains will increase by 5%, while the valuation effects will be 5. Ceteris Paribus, if 10% of foreign liabilities are denominated in foreign currencies, a 10% appreciation of foreign currencies will bring about 4% increase in the rate of capital gains while the valuation effects become 4. Now, suppose the scale of foreign liabilities increases to 1,000 while holding the scale of

foreign assets at 100. Half of foreign assets are denominated in foreign currencies while 90% foreign liabilities are denominated in local currency. then a 10% appreciation of foreign currency will bring about a 4% increase in the rate of capital gains, but the valuation effects will be -5.

The above calculations illustrate that the rate of capital gains are not necessarily the same as valuation effects. Similar calculations show that the relationship. Between the rate of excess return and valuation effects are also not monotonic. In some special cases, the two may even be negatively correlated (see the fourth scenario of the Table 1). The logic is that the impact of exchange rate on the rate of excess return is affected by the currency structure of foreign assets and liabilities (the share of foreign assets and liabilities denominated in foreign currencies), while its impact on valuation effects is affected by the foreign currency exposure of net foreign assets (the gap between foreign assets and liabilities denominated in foreign currencies). That is why in the second and third scenarios in Table 1, when the external debt increased from 100 to 1,000 given the same currency structure, valuation effects are reduced by 9 units, while the rate of excess return was not affected.

Table 1. Excess Return and Valuation Effects under Different Scenarios

Case	Foreign Assets	Foreign currency (A)	Foreign Liability	Foreign currency (L)	Excess Return	Valuation Effects
1	100	0.5	100	0	5%	5
2	100	0.5	100	0.1	4%	4
3	100	0.5	1000	0	5%	5
4	100	0.5	1000	0.1	4%	-5

The above analysis shows that both the rate of excess return and the valuation effects are important indicators measuring a country's external wealth, which are closely related to a country's external wealth management capabilities, financial development levels, and differences in status in the international monetary and financial system. The two concepts are linked via the rate of capital gains, which reflects the impact of exchange rate and asset price fluctuations on the market value of a country's external wealth, but differs in definition and measurement. Holding the currency structure of foreign assets and liability constant, the changes of foreign currency exposure of net foreign assets will lead to changes in valuation effects but not excess return. Meanwhile, since excess return consists of both capital gain and investment income, it is a more comprehensive indicator of a country's foreign investment return compared with valuation effects, which explains why many economists prefer to use excess return rather than valuation effects when discussing a country's foreign investment positions.

5. Valuation Effects and Financial Adjustments

Financial adjustment was coined by Gourinchas and Rey [6] when applying the concept of valuation effects

proposed by Lane and Milesi-Ferretti [1] to the discussion on the external imbalance adjustment. Corresponding to traditional trade adjustment channel, they innovatively came up with financial adjustment channel to illustrate the increasing impact of international financial activities on external adjustments.

The traditional theory of balance of payments focuses on trade (net export) as the key measure for a country's external imbalance, which corresponds to the trade adjustment channel. A country is in positive imbalance if its exports are larger than imports, while in negative imbalance otherwise. Based on that, Gourinchas and Rey [6] argued that external adjustments should also involve financial adjustment associated with valuation effects in addition to trade adjustment, which will provide a more reasonable and effective way to measure a country's external imbalance.

According to the sixth edition of the Balance of Payments and International Investment Position Manual compiled by the International Monetary Fund, an economy's external account consists of both the BOP and IIP. BOP records the economic transactions during a period of time (usually a year or a quarter) between residents and non-residents, while IIP reflects the stock of foreign assets and liabilities at a specific time. Trade adjustments mainly involve current account flows under BOP, while financial adjustments refer to changes in the stock value of net foreign assets caused by the exchange rate and asset price fluctuations under IIP. The mechanisms of trade and financial adjustments are illustrated in Figure 2.

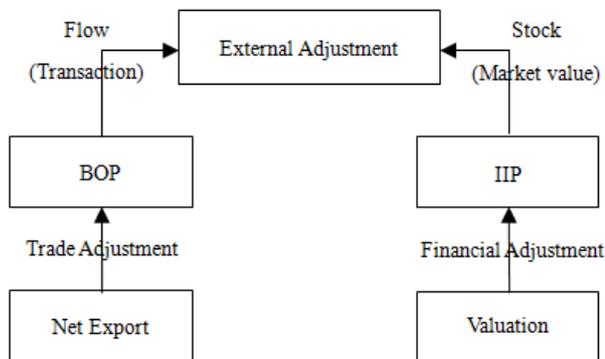


Figure 2. Mechanisms of Trade and Financial Adjustments

In the past decade there have been many studies, some theoretical and some empirical, on financial adjustments, most of which adopts the two-channel external adjustment model constructed by Gourinchas and Rey (2007) to show quantify the contribution of trade adjustment and financial adjustment, respectively. However, there still lacks detailed discussion on the components of financial adjustments in literature.

There is some degree of inconsistency in [6], perhaps due to practical reasons of calculations. They defined financial adjustments by deriving it from the unrealized capital gains (or losses) in net foreign assets, which is valuation effects. However, when modelling and quantifying financial adjustments, they mainly relied on the rate of excess return (see Equation (9), where nx_{t} measures a country's external imbalances, and the two

items of the right-hand side represent the trade adjustments and financial adjustments, respectively).

$$nx_{t} = -\sum_{j} \beta^{j} E_{t}(\Delta nx_{t+j}) - \sum_{j} \beta^{j} E_{t}(r_{t+j}) \quad (9)$$

As discussed in previous sections, in addition to capital gains, excess return also includes the yields of investment income, which is recorded as Primary Income under BOP and thus is realized gains (or losses). Therefore, strictly speaking, their calculation was not in line with their definition of financial adjustments. Accordingly, we propose that the calculations of financial adjustment needs to be improved. Specifically, the current calculated financial adjustment channel needs to be further divided into valuation effects adjustment channel and investment income adjustment channel to resolve the inconsistency between definitions and measurements

6. Conclusions

This paper reviewed the definition and the measurement of valuation effects and argues that dark matter, excess return, and financial adjustments, while closely associated with valuation effects, should not be used interchangeably in research. Valuation effects reflects the impact of exchange rate and asset price fluctuations on a nation's external wealth. Dark matter is also proposed when analyzing the difference between current account balances and changes in net foreign assets, but emphasizes on invisible or underestimated foreign assets. Excess return, although connected with and valuation effects through the rate of capital gains, involves the yields of investment income, which is not captured in valuation effects. Similarly, the contribution of financial adjustments, according to the definition, should be calculated with valuation effects rather than excess returns.

Clearly defined concepts provide first steps to theoretical analysis and applied research in any fields of studies. This paper, discussing the definition of valuation effects and compare it with related concepts, such as dark matter, excess return, and financial adjustments, contributes to the literature by solidifying the base of research a nation's external wealth transfers.

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