Asian Academy *of* Management Journal *of* Accounting *and* Finance

AAMJAF Vol. 14, No. 2, 45–64, 2018

FINANCIAL SECTOR AND AGGREGATE IMPORT DEMAND: A GENERAL EQUILIBRIUM PERSPECTIVE WITH JAPAN DATA

Tuck Cheong Tang

Department of Economics, Faculty of Economics and Administration, University of Malaya, 50603 Kuala Lumpur, Malaysia

E-mail: tangtuckcheong@um.edu.my

ABSTRACT

This study explores the role of financial sector on import demand behaviour (the real sector) from general equilibrium perspective, which is based on the portfolio balance approach to capture financial market. Japan's data support partially this hypothesis given non-cointegration finding, while foreign interest rate is significant i.e. reduces Japan's imports. Growth in foreign income is the most influential factor, and domestic economic growth both make more imports. However, the relative price of domestic goods, and domestic interest rate are insignificant. Japan's monetary policy (interest rate) is inappropriate in altering the behaviour of imports in Japan, but fiscal policy that influences Japan's economic growth.

Keywords: aggregate import demand, financial sector, general equilibrium perspective, Japan, portfolio balance approach

INTRODUCTION

This study proposes a structural framework for analysing long-run aggregate import demand that is derived from a general equilibrium perspective. This framework differs from the partial equilibrium approach by incorporating both real factors and financial factors of the economy. In general, partial equilibrium

Publication date: 31 December 2018

To cite this article: Tang, T. C. (2018). Financial sector and aggregate import demand: A general equilibrium perspective with Japan data. *Asian Academy of Management Journal of Accounting and Finance, 14*(2), 45–64. https://doi.org/10.21315/aamjaf2018.14.2.3

To link to this article: https://doi.org/10.21315/aamjaf2018.14.2.3

analysis focuses on one market at a time under the strict proviso of *ceteris paribus*. This approach has been applied to import demand analysis with a focus on the real sector of the economy. The influence of the financial sector in the import demand decision is essentially ignored on the grounds of the classical homogeneity or neutrality postulate that financial forces are essentially accommodating. Some existing studies have considered the role of select financial variables such as bank credit, money supply, or interest rates as additional explanatory variables of import demand (Athens, 1985; Ceglowski, 1991; Craigwell, 1994; Tang, 2004). But these specifications have been generally of an *ad hoc* nature rather than being embedded in a formal general equilibrium framework.

In an open economy, the real resource flows also involve cross-border transactions, exports and imports of goods and services. Firms import real resources such as raw materials and final products that cannot be provided domestically, while they export those goods and services that are in excess of domestic requirements. The cross-border real resource flow is typically regarded as the swapping of some real resources for other real resources. In formal analysis it is treated as if it were a barter system with balanced exchanges where financial considerations have no independent role to play. In a monetised economy, as distinct from a barter system, any transaction or exchange has by definition a monetary or financial side. This is captured in Clower's (1967) memorable phrase that "money buys goods and goods buy money." This implies that the goods market flow is necessarily associated with an equivalent financial flow. The circular flow relationship merely depicts the fundamental simultaneity between the real sector and the financial sector. This relationship has received extensive attention in closed (autarky) economy analysis but has traditionally been ignored in the analysis of international trade flows. The systemic simultaneity implies that adjustment behaviour in the financial sector may be one of the forces that drive adjustment flows in the goods and services market. And, *vice versa*, imbalances in goods markets may be one of the factors that determine adjustment behaviour in the financial sector.

This interdependence raises interesting questions about the relative importance of financial and real factors in influencing the demand for imports. In the absence of money illusion non-monetary factors, that is the "real" factors of tastes, resources, and technology, are the ultimate determinants of production, consumption, *trade* and relative prices in economic equilibrium. The goods and services which each sector absorbs must be paid for with financial assets, money or bonds (Mundell, 1963, p. 476–477). It follows from the fundamental simultaneity property that financial disturbances may well affects the gross and net flows of cross-border exchanges of goods and services.

Table 1 describes briefly Japan's imports and other key macroeconomic variables, particularly, financial development, and real interest rate for 1970–2016. Imports contribute a 10-year average of between 8%–17% of Japan's Gross Domestic Product (GDP) with the highest share in 2010–2016. The Japanese Yen appreciation (i.e. the strongest Yen in 2010–2016) may explain the higher share of imports that it is cheaper to buy from abroad. Interestingly, Japan's imports are behaved reversely to financial development (i.e. domestic credit to private sector). More financial developments (1970–1979 to 1990–1999), are observed with less imports (% of GDP), while lower financial development (1990–1999 to 2010–2016) reveals higher imports. Imports and Japan's real interest rate have unclear correlation that lower interest rate (1980–1989 to 1990–1999) comes with lower imports share, but reverse is observed then that lower interest rate (1990–1999 to 2010–2016), shows higher imports. These high imports shares are associated with low GDP growth since 1990–1999 which is opposite to traditional import demand behaviour.

Table 1
Selected key macroeconomic variables of Japan, 1970–2016

Year	Imports (% GDP)	Domestic credit to private sector (% GDP)	Exchange rate (JPY per USD)	GDP growth	Real interest rate
1970−1979	11.0	124.0	286.9	4.1	−1.6
1980−1989	10.9	150.9	198.9	4.4	4.7
1990−1999	8.3	201.4	118.8	1.6	3.7
2000−2009	12.1	183.7	112.0	0.5	3.0
2010−2016	16.6	178.4	97.3	1.5	1.4

Source: World Development Indicators.

Japan is established for empirical illustration for several research issues. Firstly, most of the past studies (see, Tang, 2008; 2015) for Japan's aggrege import demand use traditional determinants i.e. real income, and relative price of imports. Their inclusion of financial variables, which is generally considered as *ad hoc* rather than being embedded in a formal theoretical framework. Secondly, Japan is an island neighbouring by China, South Korea, the Philippines, North Korea, Taiwan and Russia. It geographically promotes trade especially imports. The 2016 statistics show Japan the fifth largest importer in the world with that recently led by crude petroleum, and petroleum gas. But, Japan's imports have decreased by an annualised rate of 3% for 2011–2016.[1] Thirdly, Japan has experienced rapid economic growth in the past few decades, in which demand for imports has had a historical significance to Japan's economy i.e. importing

raw materials and by processing (adding value to) them before exporting in the export-led policy. Finally, Japan plays a competitive role in international trade as a member of multiple international trade organisations (Asia Pacific Economic Cooperation [APEC], World Trade Organisation [WTO], Organisation for Economic Co-operation and Development [OECD], Group of Eight [G8] and Group of Twenty [G20]). Indeed, Japan still maintains protectionist policies in numerous industries, particularly in agriculture.[2] These stylised facts motivate this study to Japan's import demand behaviour especially, the role of financial sector.

This study shows that financial sector partially supports the demand for imports with Japan's data. No long-run (cointegration) import demand for the specification proposed, but its 'financial sector' determinants, [change in] foreign interest rate is negatively significant, and foreign income is the most influential factor for more imports. The domestic interest rate is insignificant.

LITERATURE REVIEW

There has been rich amount of studies that have attempted to examine the aggregate demand behaviour for imports (i.e. goods and services), empirically for both the developed and developing nations. They (Chang, 1945–1946; Houthakker & Magee, 1969; Khan, 1974; Gafar, 1988; and Senhadji, 1998, for examples), have basically employed the traditional or conventional specification of import demand function that relating the volume of imports to two fundamental factors (real income, and relative price of imports). It is assumed that the demand behaviour is determined by one market of the economy; the partial equilibrium approach that the goods and services market or real sector under the strict proviso of *ceteris paribus*. However, this approach ignores the influence of the financial sector.

Some studies examined the aggregate import demand behaviour with financial variables such as money supply, interest rates, remittance, financial development, and bank credit, including volume of tools used in financing trade, and trade credits (see, Table 2). They concluded that 'finance' is important and has significant effects on imports. However, they do not provide any systematic theoretical derivation of their import demand specifications. Recent work by Ziramba and Mumangeni (2017) consider bank credit in explaining imports in South Africa as the previous studies did. For examples, Athens (1985) examines the role of the money market in import demand behaviour for the U.S. and the U.K. Accordingly, if there is an excess supply of money, the foreign sector will provide the means for restoring the private sector's stock equilibrium through

Table 2
Summary of existing studies that recognise financial determinants of import demand

Study	Country sample period	Financial variable(s)	Justification(s)	Findings
Athens (1985)	U.S. & U.K. [1960q1–1979q4]	Money supply	Omission of money market variable. Monetary approach for long-run balance of payment flows.	A direct link (positive) between money supply and import demand.
Ceglowski (1991)	U.S. [1968q1–1988q4]	Real interest rate	Consumption theory-with intertemporal optimisation that import demand varies positively with the expected real interest rate.	Real interest rate is significant.
Craigwell (1994)	Barbados [1960–1993]	Private sector credit	Credit is a ready and necessary source of financing increases in spending.	All variables are cointegrated. Credit is positively related to imports.
Tang (2004)	Japan [1973q1–2000q2]	Bank credit, lending rate, deposit rate, government bond yield, & share prices	$TB = S–I$, the variables affecting savings (S) and investments (I) may also influence imports.	All variables are cointegrated. The financial variables have positive sign.
Tang (2006)	Malaysia, Indonesia, Thailand, the Philippines [1960–2000] & Singapore [1974–2000]	Band credit	As Craigwell (1994)	All variables are cointegrated. Credit has positive sign.
Muktadir-Al-Mukit et al. (2013)	Bangladesh [2005m1–2011m12]	Remittance	Remittances increases demand on goods and services, then domestic price, which result more imports. Remittances increase foreign currency supply-appreciate local currency, cheaper imports.	Remittances and imports are cointegrated. Remittance has positive sign (long-run), but, insignificant in the short-run. No causation from remittance to imports, but otherwise.
Auboin & Engemann (2014)	Panel data of 91 countries [2005q1–2011q4]	Short-term insured trade credits	Trade credit -working capital financing in standard equation for imports.	Trade credit has positive effect on real imports.
Altan (2016)	Turkey [1990–2015]	Volume of the tools used in financing foreign trade	Various payment methods promote foreign trade via financing.	Payment methods are important to imports.
Ahad et al. (2017)	Pakistan [1972q1–2012q4]	Financial development (domestic credit to private sector)	Pakistan implemented reforms to improve trade and financial development.	All variables are cointegrated. Financial development has positive sign. Feedback effect between financial development and imports.
Ziramba & Mumangeni (2017)	South Africa [1965 to 2014]	Bank credit	Follow past studies	All variables are cointegrated. Bank credit is significant in the short-run.

increases in imports or net capital outflows. Therefore, monetary disequilibrium will have an impact on the demand for imports (Athens 1985, p. 93). The results show that imports are positively influenced by money supply (M3). Also, Ceglowski (1991) commented that conventional import demand specifications do not consider intertemporal choice which would emphasize the importance of real interest rates for import determination; changes in the expected real interest rate alter the price of current consumption relative to future consumption and may affect the intertemporal allocation of consumption. Therefore, an increase in expected real interest rates should induce households to substitute future consumption for current consumption.

In the open economy context, this intertemporal substitution implies a reduced demand for imports in the present and increased future import demand. Based on quarterly U.S. data 1968–1988, the study identifies a positive elasticity of intertemporal substitution for imports. This suggests a role for the real interest rate in influencing the demand for imports. The intertemporal aspects of import demand suggest real interest rates provide a second channel through which macroeconomic policy can alter the level of imports and the trade balance (Ceglowski, 1991, p. 119). Craigwell (1994) viewed on the influence of bank credit on aggregate import demand as a "ready and necessary source to finance increases in spending". The empirical results show a positive influence of bank credit for Barbados's import demand, and the underlying variables (with bank credit) are cointegrated. But, it is not for the conventional specification. Craigwell argues that this finding suggests misspecification in conventional import demand specifications. Croix and Urbain (1998) pointed out that most of the conventionally specified import demand models are derived from a pure empirical exercise and that either *pseudo*-reduced form models or dynamic specifications usually have 'naïve' theoretical foundations.

GENERAL EQUILIBRIUM PERSPECTIVE: AGGREGATE IMPORT DEMAND RELATION

This section explores a simple general equilibrium structure for an aggregate import demand relation with assumptions of fixed exchange rates, and that capital moves freely between national economies. The general equilibrium perspective covers two fundamental approaches: (1) Income-expenditure equilibrium, which is *de facto* still partial because it looks only at one market, the goods and services market; it ignores the role of the financial sector (money market and bonds market); and (2) Portfolio balance approach that captures the financial market. This section focuses on the second one.[3]

Financial Market: Portfolio Balance

Financial sector considers money market and bond market. Money market equilibrium requires that the stock of money is willingly held by the public. It requires that the money stock supplied by the central bank and the banking system is equivalent to the private sector demand for money. The stock supply of money is backed by central bank assets, domestic credit (*DC*) which represents central bank lending to the private sector, prominently the banking system, and to the government, and by international reserves (*IR*). The stock and flow clearing conditions in the money market fulfil that $M^d = M^s = DC + IR$, and $\Delta M^d = \Delta M^s = \Delta DC + \Delta IR$. In open economies, the money supply is influenced by international reserve flows. The response of money supply to domestic credit and international reserves depends on transactors' behaviour to demand cash balances. Portfolio balance behaviour suggests that transactors desire an optimum amount of money and other assets. If that is not provided by the monetary authority they try to secure it through other means by building up cash balances through reduced spending. In an open economy, the reduction in spending improves the trade balance and draws in reserves. Hence, any excess stock demand for money that is not accommodated by domestic monetary expansion will draw international reserves into the domestic monetary system to expand the money stock endogenously.

Similarly, stock equilibrium in the bond market requires that transactors willingly hold the existing stock of income-bearing financial assets. The bond market clearing condition is that the stock demand for bond holdings must equal the net stock supply of bonds ($B^d = B^s$). In an open economy characterised by capital mobility, domestic residents are not restricted to domestically issued bonds but they can also hold bonds that are issued abroad. Since central banks do not hold privately issued securities all bonds issued in the private sector are held by private wealth owners. The net stock supply consists of bonds issued by the domestic government (B^g) and by foreign agents, private and public (F). Hence, stock and flow clearing conditions in the bonds market are $B^d = B^s \equiv B^g + F$, and $\Delta B^d = \Delta B^s \equiv \Delta B^g + \Delta F$. Since the stock of government bonds is determined exogenously, flow equilibrium implies that an excess demand for bonds must be satisfied by additional foreign bond holdings, and conversely.

The basic premise of the monetary approach is that in a monetised economy the money demand function and the money supply process should play a central role in balance of payments (BoP, hence after) analysis and, hence, in the determination of its flow components, particularly in the long-run (Mussa, 1974). The monetary approach to the BoP challenges pre-modern understanding of money in a manner similar to David Hume.[4] Paganelli (2006, p. 537) argues that

money is not the cause of trade in general but excess money supply can change the trade pattern through changes in the price level which make domestic goods less attractive compared to foreign goods. A deterioration of the trade balance with domestic inflation implies, ceteris paribus, that the domestic supply of money decreases. The BoP is an accounting record that is reckoned in monetary terms by the principles of double-entry bookkeeping. Any imbalance in its component accounts (current or trade account and capital account) represents a discrepancy between money receipts and money payments. This suggests that the BoP is governed by monetary forces and monetary policy rather than by real factors such as real incomes and relative prices operating through spending propensities and price elasticities of demand for exports and imports (Johnson, 1972).

According to Mussa (1974), the monetary approach to the balance of payment does not attempt to provide a theory of the individual component accounts such as goods, services, transfers, short-and long-term capital. Instead, the monetary approach attempts to provide only a theory of the overall BoP outcome in the sense of the balance of autonomous transactions between residents of one country and the rest of the world. To the extent that monetary forces influence the overall outcome they must affect (at least some of) the individual component accounts of the BoP. Imports and exports are traded in exchange for some *quid pro quo.* These are typically financial instruments – money or bonds. Hence, net imports must be matched by corresponding "accommodating" financial flows (International Monetary Fund, 1993, p. 159). The same logic applies to cross-border capital flows. Domestic and foreign bonds are also traded in exchange for some *quid pro quo* so that net purchases are reflected in corresponding cross-border "accommodating" financial flows. These "accommodating" financial flows affect the portfolio balance of domestic wealth owners which leads to adjustments that may impact on their spending plans, including expenditure on traded goods.

External Balance

The BoP accounts record each cross-border transaction and its settlement (*quid pro quo*). From this principle of double-entry book-keeping it follows that, *ex post,* the sum of all international transactions (on current and capital or financial account) and their settlements (flows of reserve assets) must be equal to zero. Analogously, *ex ante* it captures a requirement for general flow equilibrium in the three markets of the economy. In terms of BoP accounting categories this means that net cross-border resource flows, i.e. net exports of goods and services (CA), must be financed by an equivalent net cross-border flows of money and bonds. Thus, the BoP constraint is $CA_t + [KA_t + \Delta IR_t] = 0$[5] where CA is the current account balance, KA is the capital account balance and ΔIR denotes the balance

of official monetary movements. Rearranging this identity yields an equation for the demand for imports which explicitly recognises the potential influence of the financial sector working through net capital movements and cross-border reserve flows:

$$CA_t = X_t - IM_t = -(KA_t + \Delta IR_t)$$

$$IM_t = X_t + (KA_t + \Delta IR_t) \quad (1)$$

Equation (1) shows that import demand is influenced by portfolio balance behaviour in assets markets. Specifically, it recognises that the planned flow of imports can be "funded" by planned exports obviating the need for any net financial settlement flows. Alternatively, any excess import demand must be financed by disposals of domestic holdings of financial assets (either by sales of foreign bond holdings or by foreign borrowing or by a reduction of international reserve holdings). Conventional monetary analysis provides the behavioural determinants that drive adjustment behaviour. The demand for real money is positively related to a scale variable (Y) that captures the volume of transactions to be effected and negatively related to interest rates (r) which determine the opportunity cost of holding money. Accordingly, the demand for nominal balances is given by $M^d = P.L(Y, r)$. The stock supply of nominal money is determined by the volume of domestic credit (DC) extended by the central bank and the holdings of international reserves (IR), $M^s = DC + IR$.

With the assumption of purchasing power parity, $P = EP_w$, favoured by the monetary approach, where E denotes the nominal exchange rate and P_w the world price level, the demand function for money in stock and flow terms can be rewritten as $M^d = EP_w.L\ (Y^{(+)}, r^{(-)})$, and $\Delta M^d = \Delta E + \Delta P_w L\ (Y^{(+)}, r^{(-)})$. Combining the flow equilibrium condition for the money market, and the BoP constraint, substituting the demand for money (ΔM^d) and rearranging yields a general import demand relation that captures money and bond market developments, $IM_t = X_t + KA_t + [\Delta E + \Delta P_w.L\ (Y,r)]_t - \Delta DC_t^0$. With fixed exchange rates, $\Delta E = 0$, so that this equation simplifies to $IM_t = X_t + KA_t + [\Delta P_w.L\ (Y,r)]_t - \Delta DC_t^0$. For flexible exchange rates, $\Delta IR = \Delta M^d - \Delta DC = 0$, and the import demand relation becomes $IM_t = X_t + KA_t$. This derivation supports the inclusion of bank credit and money supply variables in import demand analysis by Craigwell (1994) and Athens (1985) from different conceptual frameworks. By way of placing the bond market into more direct focus we can replace the capital account variable in the equation by the change in net foreign bond holdings. $\Delta F > 0$, the net acquisition of foreign bonds, constitutes a capital outflow or negative capital account balance ($KA < 0$).

FUNCTIONAL RELATIONS, AGGREGATE IMPORT DEMAND EQUATIONS AND EMPIRICAL ILLUSTRATION

Interpreting Equation (1) and its underlying building blocks as behavioural relationships yields:

$$IM_t(.) = X_t(.) + KA_t(.) - \Delta IR_t(.)^6$$

or

$$IM_t(.) = \mathrm{X_t}(.) + KA_t(.) - [\Delta P_w.L(Y, r)]_\mathrm{t} + \Delta DC_t^0 \qquad (2)$$

where each term is written in functional notation in order to emphasise the behavioural nature of the variables reflecting planned magnitudes. Equation (2) is derived not from partial equilibrium considerations but from the market clearing requirements in the goods market. Equation (2) states that an increase in imports is associated with an increase in exports, capital inflows or reserve losses, or some combination of these changes. It brings into clear focus that import demand is determined not only by relative price considerations and spending propensities but also by the overall resource requirements of the home economy.

These associations are captured by Equation (2) which relates the demand for imports to the overall macroeconomic balance of the domestic economy. An open economy permits market imbalances provided they are mutually consistent.[7] That consistency requirement is captured in the BoP constraint. In a one-period equilibrium,[8] an economy may well 'spend beyond its means' if the excess spending (net imports from abroad) is funded by equivalent net financial inflows. But those financial inflows or reductions in net claims on the rest of the world, must be consistent with the equilibrium requirements in the domestic assets markets. Equation (4) thus captures both the real sector (exports and imports) and the financial sector (bond and international reserve flows). When exchange rates are not perfectly flexible international reserve flows create disturbances in the domestic money market ($\Delta IR \neq 0$) which are likely to feed into the goods and bond markets as wealth owners react to the disturbance of their portfolios. Conversely, when exchange rates are flexible changes in real exchange rate alter the value of real money balances and create price disturbances in the markets for domestic goods which will have further repercussions in the remaining sectors of the economy.

The determinants of the right-hand side behavioural variables can be derived from conventional assumptions of economic behaviour or economic structure. The demand function for exports $X_t(.)$ relates the quantity of exports to world/foreign income, Y^*, and relative price of domestic goods, P_{dt}/P_{wt}

(where P_d represents domestic prices; P_w is the world price). This relative price variable has a negative impact on exports as an increase in relative domestic prices decreases exports. The aggregate demand for exports is positively related to world income through import propensities. The capital account balance (*KA*) is the difference between the change in foreign ownership of domestic assets and the change in domestic ownership of foreign assets. Changes in income, the world interest rate, exchange-rate expectations and in monetary policy instruments have strong effects on the capital account (Kouri & Porter, 1974). For simplicity, it is assumed that the capital account balance is dominated by the cross-border yield differential which is captured by the difference between the interest rates at home (r) and abroad (r^*). An increase in domestic interest rates attracts inflows of capital that re-establish interest rate parity by easing credit conditions in domestic financial markets. The foreign interest rate has the reverse influence on the capital account as improved profitability of foreign assets encourages their purchase by domestic residents (and repatriation of cross-border investments by foreign residents), lowering the capital account balance. However, exchange rate expectations and inflation expectations may attenuate or even reverse these effects. If increases in domestic interest rates are associated with higher expectations of depreciation then the expected capital losses reduce the attraction of domestic assets. Households will tend to reduce cash balances and other domestic asset holdings to buy foreign bonds (capital outflow). Similarly, with strong inflation expectations real interest rates are expected to fall, once again reducing the attractiveness of domestic assets. The domestic credit (*DC*) variable is assumed to be exogenous. The behavioural variables in import demand relation (2) can be presented as follows.

$$IM_t = X_t(Y^*_t{}^{(+)}, P_{dt}/P_{wt}^{(-)}) + KA_t(r_t^{(+)}, r^*_t{}^{(-)}) - [\Delta P_w.L\ (Y^{(+)}, r^{(-)})]_t + \Delta DC_t^0 \qquad (3)$$

where r and r^* are domestic and foreign real interest rates, Y and $Y^*$are domestic and foreign income, P_d is domestic price and P_w is the world price. The superscripted symbols (.) note the direction of adjustment of the right-hand side behavioural variables.

Equation (3) represent the general equilibrium demand functions for imports derived from the market clearing conditions in the financial market. It emphasises the potential influence of financial factors on import demand. An increase in domestic interest rates (r)[9] or foreign income (Y^*) raises the demand for imports, while domestic activity (Y), the relative price of domestic goods (P_d/P_w) and foreign interest rates (r^*) return negative effects on imports. As interest rates reflect the opportunity cost of holding money, an increase in interest rates leads to an excess supply of real money balances which would

tend to stimulate imports (as well as capital inflows). An increase in domestic activity (Y) increases the demand for cash balances. If this demand is not satisfied through monetary expansion, transactors will need to reduce their spending including purchases of imported goods and services to build up their cash balance holdings. The effect of foreign activity (Y^*) and relative price of domestic goods (P_d/P_w) are driven by their direct effects on exports as discussed in the income-expenditure approach. Domestic inflation and income expansion also initiate portfolio substitutions as they increase the demand for nominal balances. In the absence of accommodating monetary expansion this requires that households reduce spending including spending on imports. Lastly, the demand for imports is expected to be negatively associated with foreign interest rates (r^*). An increase in foreign interest rates reduces the interest rate differential in favour of the domestic country and attracts capital outflows. In the absence of official financing, deteriorations of the capital account balance require improvements on current account.

Given full employment, increases in exports must be "funded" by resources that are imported from abroad in the absence of any accommodating drop in domestic absorption. In the absence of reserve movements an improvement on capital account can occur only if there is a corresponding deterioration on current account. Failing such a deterioration, any attempt to obtain domestic bonds can be accommodated only through portfolio substitutions that will leave the net foreign asset position unchanged.

For empirical implementation, the equation modelling import demand can be estimated by the structural import demand equations in reduced form (4). This equation captures the minimalist functional form of the behavioural structure of import demand that is informed by the equilibrium requirements in the financial market. The domestic credit (DC^0) is assumed to be exogenous to import demand.

$$IM_t = \Delta DC_t^0 + IM_t(Y_t^{(-)}, P_{dt}/P_{wt}^{(-)}, Y_t^{*(+)}, r_t^{(+)}, r_t^{*(-)}) \tag{4}$$

Equation (4) has been proposed for the case of Japan since the past studies have substantially considered this country (see, Tang, 2008; 2015). Some of them are with financial variables as omitted determinants for import demand, but, their specifications are *ad hoc*. Therefore, it adds the existing literature with new findings. An empirical illustration with the Japan's data is documented. Double-log linear form[10] of data-driven import demand regressions of Equation (4) is being presented as follow.

$$ln\mathrm{IM}_t = \beta_0 - \beta_1 lny\mathrm{Y}_t - \beta_2 ln(\mathrm{P}_{dt}/\mathrm{P}_{wt}) + \beta_3 ln\mathrm{Y}^*_t + \beta_4 \mathrm{r}_t - \beta_5 \mathrm{r}^*_t + \mathrm{u}_t \tag{5}$$

The variables *IM*, *Y*, *r*, r^*, Y^* and P_d/P_w are obtained from *International Financial Statistics* for the period 1970Q1–2016Q3. *IM* is volume of imports; *Y* is real GDP; *r* is real domestic interest rate (*r*) that nominal yield on Japanese government bonds minus the Japanese inflation rate (2000 = 100); r^* is real foreign interest rate (nominal U.S. Government bond yield minus the U.S. inflation rate); Y^* is real foreign activity (U.S. real GDP); and P_d/P_w is relative price of domestic goods.

Table 3 shows all variables are non-stationary, except for $ln(P_{dt}/P_{wt})$ which is inconclusive as both ADF and PP suggest stationary, *I*(0), while non-stationary by KPSS at 5% level. Therefore, Autoregressive Distributed Lag (ARDL) bound test by Pesaran, Shin and Smith (2001) is feasible. Table 4 reports the bound test statistics (*F*- and *t*-) those fall below the 10% critical values of lower-upper band, *I*(0), and no cointegration for both equations. The null hypothesis of no cointegration cannot be rejected at 10% level. The import demand Equations (9) and (10) can be estimated by OLS with variables in first-differenced, except for the price variable.

Table 3
Unit root tests

Tests	ADF	PP	KPSS
$lnIM_t$	−1.277[8]	−1.706[9]	0.269[10]***
$\Delta lnIM_t$	−4.663[7]***	−15.452[8]***	
lnY_t	−0.887[7]	−2.406[14]	0.417[11]***
ΔlnY_t	−3.866[7]***	−21.148[14]***	
r_t	−2.150[8]	−3.015[2]	0.222[10]***
Δr_t	−6.749[7]***	−10.699[6]***	
r^*_t	−2.733[5]	−2.734[4]	0.248[9]***
Δr^*_t	−6.220[6]***	−10.176[13]***	
lnY^*_t	−0.487[12]	−1.104[7]	0.282[10]***
ΔlnY^*_t	−4.687[11]***	−10.057[6]***	
$ln(P_{dt}/P_{wt})$	−6.619[12]***	−3.576[10]**	0.163[10]**

Notes: The lag order [.] of ADF is suggested by Akaike Information Criterion (AIC) for ADF, while Bartlett kernel spectral estimation method for PP and KPSS with a maximum 14 lags. For the data at levels, both the constant and trend are included, while only the constant term is applied for first-differenced data. The null hypothesis of a unit root is for ADF and PP, while the null hypothesis of trend stationarity under KPSS. KPSS tests have critical values of 0.119 (10%), 0.146 (5%), and 0.216 (1%). ***, and ** denote significant difference from zero at the 1%, and 5% levels, respectively.

Table 4
Cointegration tests-Bounds test ARDL

F-statistic = 0.949	0.10 critical values: 2.26 *I*(0); 3.35 *I*(1)
t-statistic = −1.50	0.10 critical values: −2.57 *I*(0); −3.86 *I*(1)

Notes: ARDL lag structure of $lnIM-lnY-lnP_d/P_w-lnY^*-r-r^*$ is ARDL(5,6,0,8,4,0) as suggested by AIC from a maximum lag length of 8, which is white noise (i.e. Q-statistics up to order 36). The critical values are based on $k = 5$.

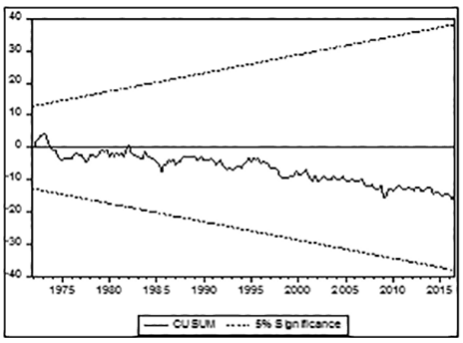
Table 5 reports the estimated Equation (5). The adjusted R^2 is noticeably low, 17%. Ramsey RESET test suggests correct specification, while LM test shows serial correlation. Jarque-Bera statistic confirms normally distributed residuals. More importantly, the estimated coefficients are considerably stable as indicated by CUSUM, and CUSUM of Squares plots. Growth in Japan's domestic income will result more imports, but inelastic. It is in line with traditional import demand framework, instead of the current framework that a negative sign is expected. Foreign income (U.S.) is in expected sign i.e. positive, and elastic (i.e. 1% increases in U.S. real GDP, Japan will import 1.5% more). Foreign interest rate has negative implication on Japan's demand for imports as expected. Nevertheless, both relative price, and Japan's interest rate are statistically insignificant (at 10% level).

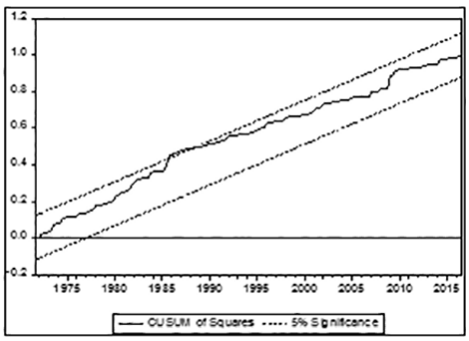
These findings can be related to the economy of Japan especially in financial section and external trade. As Table 1 shows, Japan's import share increases over 1970–2016 to 17% per GDP for 2010–2016 (the highest average). Accordingly, "Imports are strong, but exports were stronger, and this is definitely a positive reading", and Japan's politically sensitive trade surplus with U.S. soared 49.6% to USD4.8 billion on increased exports of cars and microchip-making equipment, that the two countries had battled for decades into the 1990s over trade flows.[11] Foreign income is found to be the most influential variable that higher U.S. real GDP, more imports for Japan, lowering Japan's trade surplus. The U.S. GDP increased at an annual rate of 2.6% in the fourth quarter of 2017 as estimate released by the Bureau of Economic Analysis, and in the third quarter, real GDP increased 3.2%.[12] The last may estimate 4.8% more imports by Japan. Indeed, U.S. has the world's largest trade deficit since 1975 that Japan is her second largest 'contributor', by importing automobiles, with industrial supplies and equipment.[13] Foreign (U.S) interest rate has negative implication on Japan's demand for imports. The recent U.S. policy interest rate increases from 0.25% (2012–2014) to 0.5% (2015) and 0.75% (2016)[14] may lower Japan's imports creating more surpluses in her trade account, and eventually higher U.S. trade deficit. Turning to the Japan's GDP growth of 1.5% (2010–2016, Table 1), it expects higher demand for imports by 0.47%. But, relative price of domestic

goods, and domestic interest rate have no effect for Japan's demand for imports. The recent decade of low real interest rate (1.4%), and financial development (178%) may not relate to the high import share of Japan, but as noted, weak growth and low interest rates, together with underlying demographic headwinds, are posing chronic challenges for the financial system.[15]

Table 5
Estimated aggregate import Equation (5)

Regressor:	
ΔlnY_t	0.314*** (0.067)
$ln\ (P_{dt}/P_{wt})$	0.002 (0.011)
ΔlnY^*_t	1.495*** (0.390)
Δr_t	−0.184 (0.300)
Δr^*_t	−0.830** (0.380)
Constant	−0.003 (0.006)
Adjusted R^2	0.170
F-statistic	8.553***
LM test [1]	5.828***
RESET[1] *F*-stat.	0.535
Jarque-Bera	3.158





Notes: ***, and ** denote significant difference from zero at the 1%, and 5% levels, respectively. Value in (.) is standard error. The dependent variable is in first-differenced, $\Delta ln\ IM_t$.

CONCLUDING REMARKS

This study derives a structural import demand equation that account for both real sector and financial sector influences. It is based on the portfolio balance approach emphasises adjustment processes in financial markets. This model recognises also forces operating in the financial markets, such as foreign interest rates, and different adjustment mechanisms such as the real balance effect and portfolio adjustment and their impact on goods market. The empirical results presented of using Japan's data, partially recognise the proposed aggregate import demand modelling framework by their statistically significant estimated coefficient, but no long-run relation. The non-traditional determinants such as foreign interest rates, and foreign income have significant impacts on Japan's aggregate demand for imports. Domestic GDP is consistent with traditional import demand function. But, relative price of domestic goods, and Japan's interest rate are insignificant.

The important policy can be suggested from the findings for Japan. Fiscal policy such as government spending, and/or tax plays a favorable outcome than of monetary policy in altering Japan's demand behavior for imports –lower the trade surplus by stimulating higher growth which makes more imports. Japan relies heavily on primary imports (energy imports), is inevitable that associates with economic growth. Indeed, higher tax revenue via. tariff as strong imports because of higher Japan's income, that to further finance budget deficit, as in 2015, the state deficit of Japan was at about 3.51% per GDP.[16] Growth is estimated to have picked up to 1.5% in 2017, aided by stronger international trade and fiscal stimulus.[17] Meanwhile, Japan's monetary policy, especially the interest rate channel, has no effect on imports, while Bank of Japan's negative short-term interest rate target at −0.01%, should go for financing more imports. Accordingly, Bank of Japan should maintain its expansionary monetary policy until the 2% inflation target is achieved,[18] as the relative price of domestic goods does not affect imports. The recently macroprudential policy that assure the financial system stability that promote growth (i.e. finance led growth) should be formulated, which may indirectly result more imports.

Such a conclusion, however, is dryly generated from a single country's experiences: Japan. Perhaps, it can be further strengthened by future research which considers a wider range of countries. It is worth to note that this study does not intend to replace the existing aggregate import demand function(s), but the two newly proposed equations do provide a new direction for the future research topics in international trade involving import demand function.

NOTES

1. https://atlas.media.mit.edu/en/profile/country/jpn/#Imports
2. http://www.economywatch.com/world_economy/japan/export-import.html
3. See, the seminal version in Tang (2013). For the first approach (i.e. income-expenditure equilibrium), in the goods and services market, planned expenditure (E) equals planned output (Y) per period. An equilibrium relation with the imports variable into left-hand side yields $IM_t = -(S^p{}_t - I_t) - (T_t - G_t) + X_t$ which can be rewritten as $IM_t = I_t - S^p{}_t + BD_t + X_t$ given a budget deficit (BD). The behavioural structure of this relation is $IM_t(.) = I_t(.) - S^p{}_t(.) + BD_t(.) + X_t(.)$ or more precisely, $IM_t(.) = I_t(r_t^{(-)}) - S^p{}_t(Y_t^{(+)}, r_t^{(+)}) + BD_t^0 + X_t(Y^*{}_t^{(+)}, P_{dt}/P_{wt}^{(-)})$. A reduced form of import demand function can be derived for empirical analysis with $IM_t = BD_t^0 + IM_t(Y_t^{(-)}, P_{dt}/P_{wt}^{(-)}, Y_t^{*(+)}, r_t^{(-)})$. Similar finding of non-cointegration (by bounds test) is found as to the portfolio balance approach, and both approaches give identical regression estimates. The results are available upon request from the author.
4. Fausten (1979) examined the alleged Humean origin of the contemporary monetary approach to the BoP, and he noted that the monetary approach differs in some respect from the Humean approach, "[money] is none of the wheels of trade: It is the oil which renders the motion of the wheels more smooth and easy" (Fausten, 1979, p. 670).
5. Note that in BoP accounting $\Delta IR > 0$ represents a loss of reserves, and conversely.
6. In order to make the notation consistent between the BoP relation and the money supply, redefine ($\Delta IR > 0$) as a gain in reserves. That means inverting the sign in front of the ΔIR variable in the BoP relation.
7. These imbalances are reflected in cross-border flows and, hence, strictly confined to flow equilibria. Full equilibrium, in the sense of stock and flow equilibrium, obviously precludes any such adjustment flows.
8. The sustainability over time of such imbalances is not of immediate concern in the present context. An extensive literature deals with the dynamic adjustment paths in open economies.
9. In this case the interest rate effect works through portfolio substitutions initiated by changes in the demand for money. The net effect on the demand for imports will be positive as long as the interest elasticity of the demand for bonds is smaller than the interest elasticity of the demand for money balances.
10. This form is usually used for import demand equations because of its convenience and ease of interepretation (Carone, 1996, p. 5). It is the most appropriate functional form because the estimated coefficients give directly the relevant elasticity coefficients (Thursby & Thursby, 1984). This functional form has the added advantage of avoiding estimation problems such as multicollinearity (Gafar, 1988).
11. https://www.japantimes.co.jp/news/2017/09/20/business/economy-business/japan-trade-balance-returns-surplus-strength-auto-electronics-exports/#.WnPNOKiWbIU
12. https://www.bea.gov/newsreleases/glance.htm
13. https://www.thebalance.com/trade-deficit-by-county-3306264
14. https://www.focus-economics.com/country-indicator/united-states/interest-rate

15. Financial System Stability Assessment Paper on Japan was prepared by the International Monetary Fund as background documentation for the periodic consultation with Japan, that was completed on 12 July 2017. https://www.imf.org/~/media/Files/Publications/CR/2017/cr17244.ashx
16. https://www.statista.com/statistics/270118/budget-balance-in-japan-in-relation-to-gross-domestic-product-gdp/
17. http://www.oecd.org/eco/outlook/japan-economic-forecast-summary.htm
18. As footnote 17.

REFERENCES

Ahad, M., Afza, T., & Shahbaz, M. (2017). Financial development and estimation of import demand function in Pakistan: Evidence from combined cointegration and causality tests. *Global Business Review*, *18*(1), 118–131. https://doi.org/10.1177/0972150916666909

Altan, M. (2016). The role of banks funding and promoting the foreign trade: Case of Turkey. *International Journal of Economics and Management Engineering*, *10*(7), 2438–2441. Retrieved from http://waset.org/publications/10005005/the-role-of-banks-funding-and-promoting-the-foreign-trade-case-of-turkey

Auboin, M., & Engemann, M. (2014). Testing the trade credit and trade link: Evidence from data on export credit insurance. *Review of World Economics*, *150*(4), 715–743. https://doi.org/10.1007/s10290-014-0195-4

Athens, E. P. (1985). The aggregate import equation: price homogeneity and monetary effects. *Empirical Economics*, *10*(2), 91–101. https://doi.org/10.1007/BF01973543

Carone, G. (1996). Modeling the U.S. demand for imports through cointegration and error correction. *Journal of Policy Modeling*, *18*(1), 1–48.

Ceglowski, J. (1991). Intertemporal substitution in import demand. *Journal of International Money and Finance*, *10*(1), 118–130. https://doi.org/10.1016/0261-5606(91)90030-N

Chang, T. C. (1945–1946). International comparison of demand for imports. *Review of Economic Studies*, *13*(2), 53–67. https://doi.org/10.2307/2296036

Clower, R. W. (1967). A reconsideration of the microfoundation of monetary theory. *Western Economic Journal*, *6*(1), 1–9. https://doi.org/10.1111/j.1465-7295.1967.tb01171.x

Craigwell, R. (1994). *Modelling aggregae import demand in Barbados*, Central Bank of Barbados. Retrieved from http://www.centralbank.org.bb/Portals/0/Files/WP1994-11.PDF

Croix, D. D., & Urbain, J. P. (1998). Intertemporal substitution in import demand and habit formation. *Journal of Applied Econometrics*, *13*(6), 589–612. https://doi.org/10.1002/(SICI)1099-1255(199811/12)13:6<589::AID-JAE489>3.0.CO;2-2

Fausten, D. K. (1979). The Humean origin of the contemporary monetary approach to the balance of payments. *Quarterly Journal of Economics*, *93*(4), 655–673. https://doi.org/10.2307/1884474

Gafar, J. S. (1988). The determinants of import demand in Trinidad and Tobago: 1967–1984. *Applied Economics*, *20*(3), 303–313. https://doi.org/10.1080/00036848800000044

Houthakker, H., & Magee, S. (1969). Income and price elasticities in world trade. *Review of Economics and Statistics*, *51*(2), 111–125. https://doi.org/10.2307/1926720

International Monetary Fund. (1993). *Balance of payments manual* (5th ed.). Retrieved from http://www.imf.org/external/np/sta/bop/BOPmain.pdf

Johnson, H. G. (1972). *Further essays in monetary economics.* London: George Allen and Unwin.

Khan, M. S. (1974). Import and export demand in developing countries. *IMF Staff Paper*, *21*(3), 678–693. https://doi.org/10.2307/3866553

Kouri, P. J., & Porter, M. G. (1974). International capital flows and portfolio equilibrium. *Journal of Political Economy*, *82*(3), 443–467. Retrieved from http://www.journals.uchicago.edu/doi/pdfplus/10.1086/260207

Miller, S. M., & Russek, F. S. (1989). Are the twin deficits really related? *Contemporary Policy Issues*, *7*(4), 91–115. https://doi.org/10.1111/j.1465-7287.1992.tb00218.x

Muktadir-Al-Mukit, D., Shafiullah, A. Z. M., & Sajib, A. H. (2013). Determination of causality between remittance and import: Evidence from Bangladesh. *International Journal of Business and Social Research*, *3*(3), 55–62. https://doi.org/10.18533/ijbsr.v3i3.56

Mundell, R. A. (1963). Capital mobility and stabilization policy under fixed and flexible exchange rates. *Canadian Journal of Economics and Political Science*, *29*(4), 475–485. https://doi.org/10.2307/139336

Mussa, M. (1974). A monetary approach to balance-of-payments analysis. *Journal of Money, Credit and Banking*, *6*(3), 333–351. https://doi.org/10.2307/1991173

Paganelli, M. P. (2006) Hume and endogenous money. *Eastern Economic Journal*, *32*(3), 533–547. Retrieved from http://www.jstor.org/stable/40326294

Pesaran, M., Shin, Y., & Smith R. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, *16*(3), 289–326. https://doi.org/10.1002/jae.616

Senhadji, A. (1998). Time-series estimation of structural import demand equations: A cross-country analysis. *IMF Staff Papers*, *45*(2), 236–268. https://doi.org/10.2307/3867390

Tang, T. C. (2004). Does financial variable(s) explain the Japanese aggregate import demand? A cointegration analysis. *Applied Economics Letters*, *11*(12), 775–780. https://doi.org/10.1080/1350485042000236584

Tang, T. C. (2006). Aggregate import demand and bank credit in Southeast Asia: An empirical study. *International Journal of Economics and Management*, *1*(1), 117–139. Retrieved from http://www.ijem.upm.edu.my/vol1no1/6.pdf

Tang, T. C. (2008). The demand for imports in Japan: A review article. *International Journal of Business and Society*, *9*(1), 53–76. Retrieved from http://www.ijbs.unimas.my/repository/pdf/VOL9NO1(abs4).pdf

Tang, T. C. (2013). A general equilibrium perspective of aggregate import demand, *Department of Economics Discussion Paper 06/13*, Monash University, 1–23. https://www.monash.edu/__data/assets/pdf_file/0008/925721/a_general_equilibrium_perspective_of_aggregate_import_demand.pdf

Tang, T. C. (2015). "Common factors", cointegration, and Japan's aggregate import demand function. *International Journal of Economics and Management*, *9*(2), 34–53. Retrieved from http://www.myjurnal.my/public/article-view.php?id=90191

Thursby, J. G., & Thursby, M. C. (1984). How reliable are simple, single equation specifications of import demand? *The Review of Economics and Statistics*, *66*(1), 120–128.

Ziramba, E., & Mumangeni, J. (2017). Bank credit and aggregate import demand in South Africa: An autoregressive distributed lag approach. *European Scientific Journal*, *13*(16), 71–83. https://doi.org/10.19044/esj.2017.v13n16p71