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Are current account deficits sustainable? Evidence from panel cointegration

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Abstract

Conventional cointegration tests fail to consider information across countries, which leads to efficiency loss in estimation. In this article we apply panel cointegration tests to examine the cointegration between exports and imports among the G7. Our findings support the sustainability of current accounts among major industrial countries, which lends support to the intertemporal approach to the current account.

Keywords: Current accounts; Panel cointegration

JEL classification: F32

1. Introduction

For an open economy linked to a world market, one important aspect of intertemporal plans is the time path of the current accounts, which measures changes in national net indebtedness. The issue of stationary current accounts is important for two reasons. First, a stationary current account is consistent with the sustainability of external debts which indicates that there is no incentive for a country to default on its international debts. Second, the stationarity of current accounts agrees with the implication of the modern intertemporal model of the current account, and hence supports its validity (Obstfeld and Rogoff, 1996, p. 90).

A common feature empirically in existing literature is the finding of nonstationary current accounts using conventional unit-root tests in Dickey and Fuller (1979), Ghosh (1995) and Shibata and Shintani (1998). Another approach to examine the stationarity of current accounts is to examine the

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cointegration between exports and imports and to test the restriction of the cointegrating vector being $(1, -1)$. This approach focuses on the long-run relationship between exports and imports. Such a relationship would imply that the two series would never drift too far apart. The current account is sustainable if exports and imports are cointegrated with the cointegrating vector being $(1, -1)$, while the cointegration between exports and imports is conventionally examined by the residual based method of Engle and Granger (1987) and Philips and Ouliaris (1990).

Pedroni (1999) and Kao and Chiang (1998) recently provided a series of tests of cointegration in panels that can be viewed as extensions of these single equation tests. This paper applies the methods of Kao and Chiang (1998) to investigate the cointegration between exports and imports since their method allows us to examine the significance of cointegration coefficients. Based on the panel cointegration, we find that exports and imports are cointegrated and the cointegrating coefficient is significantly different from zero, but not significantly different from one. These findings imply that the current account deficits among industrial countries are sustainable.

The remainder of the paper is organized as follows. Section 2 provides a brief theoretical background, which is discussed in Husted (1992) and Hakkio and Rush (1991), and briefly describes the method of panel cointegration. Section 3 includes our econometric results. Finally, conclusions are summarized in the last section.

2. Theoretical background and econometric methodology

Following Hakkio and Rush (1991), Husted (1992) provides a simple framework that implies a long-run relationship between exports and imports. The individual current-period budget constraint is:

$$C_0 = Y_0 + B_0 - I_0 - (1 + r)B_{-1} \tag{1}$$

where C_0, I_0, Y_0, B_0 and r are current consumption, investment, output, international borrowing, and a one-period interest rate, respectively. $(1 + r)B_{-1}$ is the initial debt size.

After making several assumptions, Husted (1992) derives a testable model:

$$X_t = a + bM_t + \eta_t \tag{2}$$

where X is the exports of goods and services, and M is the imports of goods and services plus net interest payments and net transfer payments. For a sustainable current account deficit, b should be equal to one and η_t should be stationary. This means that exports are cointegrated with imports and the cointegrating coefficient, b, is one.

There are a number of cointegration tests, such as Engle and Granger (1987), Johansen (1991) and Philips and Ouliaris (1990), which are documented in the time series literature. However, these tests fail to take advantage of information across countries, which leads to loss of efficiency in estimation. Recently, several authors, such as Pedroni (1995), Kao and Chiang (1998) and Kao (1999), devoted their efforts to develop cointegration tests with panel data. In this article, we employ the cointegration tests proposed by Kao and Chiang (1998) and Pedroni (1995) to test whether the cointegration relationship exists in the estimated equations.

Consider the following fixed-effect panel regression:

$$X_{it} = \alpha_i + \beta M_{it} + \epsilon_{it}, i = 1, \ldots, N, t = 1, \ldots, T \quad (3)$$

where $M_{it} = M_{it-1} + u_{it}$; $\{X_{it}, M_{it}\}$ are independent across cross-sectional units and $\xi_{it} = (u_{it}, \epsilon_{it})'$ is a linear process that satisfies the assumption in Kao and Chiang (1998). Kao and Chiang (1998) derive limiting distributions for the ordinary least square (OLS), fully modified (FM) and dynamic ordinary least square (DOLS) estimators in a cointegrated regression and then show that they are asymptotically normal. As for the finite-sample superiority of the previous three estimators, Kao and Chiang (1998) find that: (i) the finite-sample bias of the OLS estimator is non-negligible, (ii) the FM estimator does not improve over the OLS estimator in general, and (iii) the DOLS estimator may be more promising than OLS or FM estimators in estimating the cointegrated panel regressions. The detailed description of the previous three statistics can be found in Kao and Chiang (1998) and therefore are not reported here.

Before estimating the cointegrating equation (3), we need to test whether exports and imports are cointegrated. Kao (1999) and Pedroni (1995) provide different statistics for this purpose. Kao (1999) presents DF and ADF types of cointegration tests in the panel data. They are DF_γ^*, DF_t^* and ADF, which are for cointegration with endogenous regressors, while DF_γ and DF_t are based on assuming strict exogeneity of the regressors. The asymptotic distributions of the previous five statistics converge to a standard normal distribution, $N(0,1)$. Building up on the assumption that regressors are strictly exogenous, Pedroni (1995) provides two test statistics, PC_1 and PC_2, which converge to a standard normal distribution.

3. Empirical investigation

3.1. Data description

We include seven major industrial countries in our sample: the United States (US), the United Kingdom (UK), France (FRN), Germany (GER), Italy (ITA), Canada (CAN) and Japan (JAP). The quarterly data from 1973Q2 to 1998Q4 are used in our empirical analysis. Our measure of exports includes exports of goods and services and our measure of imports includes imports of goods and services plus net transfer payments and net interest payments. Both exports and imports are measured as a percentage of GDP. All data are taken from the IMF's International Financial Statistics.

3.2. Empirical results

The unit-root results for both exports and imports are reported in Table 1. The test's lag order is selected based on the recursive *t*-statistic suggested by Campbell and Perron (1991). Results from Table 1 indicate that exports are $I(1)$ for all countries since the unit-root null is rejected for level data, but not rejected for differenced data. Imports are also $I(1)$ for all countries except for the UK. We therefore exclude the UK in our cointegration analysis.

Based on the residual-based cointegration method of Engle and Granger (1987), findings from Table 2 point out that exports are not cointegrated with imports for all countries in our sample. We also apply the system-based method of Johansen (1991) to examine the cointegration between exports and imports. To implement Johansen's procedure, one needs to determine the lag length in the VAR

Table 1
Unit root tests

	US	FRN	GER	ITA	CAN	JAP	UK
Level data							
X	−1.17	−1.98	−2.08	−1.75	0.67	−2.10	−1.53
M	0.37	−2.00	−2.53	−2.07	0.26	−1.70	−4.63*
Differenced data							
X	−3.02*	−4.51*	−3.26*	−4.92*	−2.59≠	−4.31*	−3.54*
M	−3.96*	−4.84*	−11.14*	−6.62*	−4.60*	−4.44*	−6.69*

Notes: (1) The number in a parenthesis indicates the lag order of the ADF test. (2) τ_{μ} statistics are reported in the table. (3) '*' and '≠' indicate the rejection of the unit-root null at 5% and 10%, respectively.

Table 2
Engle–Granger test: $X_t = a + bM_t$

	US	FRN	GER	ITA	CAN	JAP
b	0.55	0.73	0.89	0.78	1.06	0.63
ADF (4)	−1.24	−0.48	−1.21	−1.14	−2.35	−1.57

system. We test down from a general 6-lag system until reducing the order of the VAR could not be rejected using a likelihood ratio statistic. The residuals from the chosen VAR were then checked for whiteness. If residuals in any equation proved to be nonwhite, we sequentially chose a higher lag structure until they were whitened. To correct for the small-sample bias, we construct the finite-sample critical values for both trace and maximum eigenvalue tests based on the method proposed by Cheung and Lai (1993). Findings from Table 3 indicate that both trace and maximum eigenvalue tests fail to reject the null of no cointegration for all countries.

The drawback of the previously mentioned cointegration tests is their failure to consider information across countries. Recently developed techniques allow us to deal with nonstationary data in a heterogeneous panel, which yields substantial benefits by exploiting data from a cross-section. With panel data, we are able to examine the cointegration between exports and imports, and to estimate its cointegrating coefficients with a surprising degree of precision. We therefore apply the

Table 3
Johansen cointegration tests

		US	FRN	GER	ITA	CAN	JAP
$r = 0$	Trace	14.30	8.08	19.84	14.11	14.86	20.03
	λ_{Max}	11.58	6.56	14.22	10.67	11.11	11.13
$r \leq 1$	Trace	2.72	1.52	5.63	3.44	3.74	8.90
	λ_{Max}	2.72	1.52	5.63	3.44	3.74	8.90

Notes: (1) 'r' denotes the number of cointegration vectors. (2) λ_{Max} is the maximum eigenvalue statistic. (3) The 5% finite-sample critical values of trace tests for the hypothesis of $r = 0$ and $r \leqq 1$ are 21.71 and 10.05, respectively. The 5% finite-sample critical values of λ_{Max} tests for the hypothesis of $r = 0$ and $r \leqq 1$ are 17.04 and 10.05, respectively. These finite sample critical values are constructed based on the method proposed by Cheung and Lai (1993).

Table 4
Panel cointegration tests[a]

DF_r	DF_t	DF_r^*	DF_t^*	ADF	PC_1	PC_2
−20.04*	−2.95*	−35.65*	−6.45*	−1.65*	−17.56*	−17.46*

[a] The 5% critical value of the above mentioned statistic is −1.645 since the residual based test is the one-tail test.

panel cointegration method of Kao and Chiang (1998) to investigate the cointegration between exports and imports and hence the sustainability of current accounts.

Results from Table 4 indicate that the null of no cointegration is rejected by all seven statistics mentioned previously. Given the fact that exports and imports are cointegrated, we then estimate (3) by using the method of OLS, FM and DOLS. Furthermore, we test whether the cointegration coefficient, β, is significantly different from 0 and insignificantly different from 1.

Findings from Table 5 indicate that estimates of β are high relative to that from conventional Engle–Granger estimates. The estimates of β from FM and DOLS are very close to 1.0. The hypothesis of $\beta = 0$ and $\beta = 1$ are both rejected for the estimate from OLS. However, for those estimates from FM and DOLS, the hypothesis of $\beta = 0$ is significantly rejected, but the hypothesis of $\beta = 1$ is not significantly rejected. Kao and Chiang (1998) point out that the OLS estimator has a non-negligible bias in finite samples and that the DOLS estimator may be more promising than OLS or FM estimators in estimating panel regressions. Therefore, we conclude that exports and imports are cointegrated with the cointegrating coefficient being 1, which implies that current accounts are sustainable and that none of the countries in the G7 tends to default on its international debt.

4. Conclusion

A conventional cointegration test based on Engle and Granger (1987) and Johansen (1991) fails to support the existence of a long-run equilibrium between exports and imports. This finding indicates that current accounts are not sustainable in the long run. Husted (1992) argues that this finding may be misleading since the likely structure change in exports and imports is ignored. Furthermore, his empirical evidence supports the long-run equilibrium between exports and imports after taking into account the structural change and that the estimated cointegrating coefficient is not significantly different from 1. In this paper we investigate the sustainability of current accounts by using a panel

Table 5
Estimation results from the panel regression

	Bias-corrected OLS	FM	DOLS
β	0.764	0.999	0.998
H_0:$\beta = 0$	27.22*	35.18*	33.50*
H_0:$\beta = 1$	−8.404*	−0.042	−0.084
Adj-R^2	0.6311	0.573	0.435

Notes: (1) OLS, FM and DOLS are ordinary least square, fully modified and dynamic OLS method, respectively. (2) Adj-R^2 is the adjusted R^2.

cointegration approach. We find that exports and imports are cointegrated and the cointegrating coefficient is not significantly different from 1. This finding supports the sustainability of external debts among major industrial countries. It is also consistent with that of Wu (2000) who supports the stationarity of current accounts by using a panel unit-root test.

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