

Appendix 1: Absolute value of GDP and education expenditure at different level

year	GDP	elem	sec	univ
1990	1347889	9076.28	6310.33	3956.09
1991	1367117	10367.83	7400.56	4396.78
1992	1440504	11321.5	8574.97	4922.9
1993	1522344	13071.14	9371.34	5557.2
1994	1619694	15133.05	10835.33	6299.53
1995	1737741	1433.93	12530.38	6954.07
1996	1876319	21543.63	14164	7983.11
1997	1957032	24083.17	15663.5	8595.67
1998	2087828	30191.07	20100.97	11097.42
1999	2254942	34068.78	25447.89	15112.89
2000	2348481	39274.6	26057.5	16928.21
2001	2474962	40019.36	25163.47	14323.32
2002	2570935	41747.26	27498.97	15858.83
2003	2775749	44349.47	28475.89	15858.34
2004	2971464	7692.18	1423.81	2099
2005	3253073	117551.2	1749.61	2301.18
2006	3564364	16734.91	1921.064	2852.601
2007	3896636	17769.61	2527.29	3826.418
2008	4158676	19481.68	3593.65	6027.68
2009	4516071	20188.25	5447.05	7661.841
2010	4918533	31213.32	7137.63	24164.41
2011	5247530	34073.24	9458.64	24786.96
2012	5482111	41022.25	10468.61	32739.21

Source: Planning Commission, MHRD, GOI.

Appendix 2: Natural log of GDP and education expenditure

Year	GDP	ln GDP	Elem	ln Elem	Sec	ln Sec	Univ	ln Univ
1990	1347889	14.11405	9076.28	9.11342	6310.33	8.749943	3956.09	8.283011
1991	1367117	14.12821	10367.83	9.246463	7400.56	8.909311	4396.78	8.388628
1992	1440504	14.1805	11321.5	9.334459	8574.97	9.056603	4922.9	8.501653
1993	1522344	14.23576	13071.14	9.478162	9371.34	9.145411	5557.2	8.62285
1994	1619694	14.29775	15133.05	9.624636	10835.33	9.290567	6299.53	8.74823
1995	1737741	14.3681	1433.93	7.268174	12530.38	9.435911	6954.07	8.847082
1996	1876319	14.44482	21543.63	9.977835	14164	9.558459	7983.11	8.985083
1997	1957032	14.48694	24083.17	10.08927	15663.5	9.659088	8595.67	9.059014
1998	2087828	14.55163	30191.07	10.3153	20100.97	9.908523	11097.42	9.314468
1999	2254942	14.62863	34068.78	10.43614	25447.89	10.14439	15112.89	9.623303
2000	2348481	14.66928	39274.6	10.57833	26057.5	10.16806	16928.21	9.736737
2001	2474962	14.72174	40019.36	10.59712	25163.47	10.13315	14323.32	9.569644
2002	2570935	14.75978	41747.26	10.63939	27498.97	10.2219	15858.83	9.671482
2003	2775749	14.83643	44349.47	10.69986	28475.89	10.25681	15858.34	9.671451
2004	2971464	14.90457	7692.18	8.94796	1423.81	7.261092	2099	7.649216
2005	3253073	14.99511	117551.2	11.67463	1749.61	7.467148	2301.18	7.741177
2006	3564364	15.0865	16734.91	9.725252	1921.064	7.560634	2852.601	7.955986
2007	3896636	15.17562	17769.61	9.785245	2527.29	7.834903	3826.418	8.249684
2008	4158676	15.24071	19481.68	9.87723	3593.65	8.186924	6027.68	8.704117
2009	4516071	15.32315	20188.25	9.912856	5447.05	8.602829	7661.841	8.944008
2010	4918533	15.40852	31213.32	10.3486	7137.63	8.873136	24164.41	10.09264
2011	5247530	15.47327	34073.24	10.43627	9458.64	9.154684	24786.96	10.11807
2012	5482111	15.517	41022.25	10.62187	10468.61	9.256137	32739.21	10.39633

Source: Planning commission, MHRD, GOI.

Appendix 3: GDP and education expenditure at different level after first difference

Year	ln GDP	d1 ln GDP	ln Elem	d1 ln Elem	ln Sec	d1 ln Sec	ln Univ	d1 ln Univ
1990	14.11405		9.11342		8.749943		8.283011	
1991	14.12821	0.014164	9.246463	0.133043	8.909311	0.159368	8.388628	0.105616
1992	14.1805	0.052289	9.334459	0.087996	9.056603	0.147292	8.501653	0.113025
1993	14.23576	0.055258	9.478162	0.143703	9.145411	0.088809	8.62285	0.121197
1994	14.29775	0.061986	9.624636	0.146474	9.290567	0.145156	8.74823	0.125381
1995	14.3681	0.070349	7.268174	-2.35646	9.435911	0.145344	8.847082	0.098852
1996	14.44482	0.076726	9.977835	2.709661	9.558459	0.122547	8.985083	0.138001
1997	14.48694	0.042117	10.08927	0.111433	9.659088	0.10063	9.059014	0.073931
1998	14.55163	0.064695	10.3153	0.226033	9.908523	0.249435	9.314468	0.255454
1999	14.62863	0.077	10.43614	0.120835	10.14439	0.235865	9.623303	0.308835
2000	14.66928	0.040644	10.57833	0.142197	10.16806	0.023673	9.736737	0.113433
2001	14.72174	0.052456	10.59712	0.018785	10.13315	-0.03491	9.569644	-0.16709
2002	14.75978	0.038045	10.63939	0.04227	10.2219	0.088755	9.671482	0.101837
2003	14.83643	0.076651	10.69986	0.060467	10.25681	0.034909	9.671451	-3.1E-05
2004	14.90457	0.068134	8.94796	-1.7519	7.261092	-2.99572	7.649216	-2.02223
2005	14.99511	0.090545	11.67463	2.72667	7.467148	0.206057	7.741177	0.091961
2006	15.0865	0.091386	9.725252	-1.94938	7.560634	0.093486	7.955986	0.214809
2007	15.17562	0.089128	9.785245	0.059993	7.834903	0.274268	8.249684	0.293698
2008	15.24071	0.065083	9.87723	0.091985	8.186924	0.352021	8.704117	0.454433
2009	15.32315	0.082446	9.912856	0.035626	8.602829	0.415906	8.944008	0.23989
2010	15.40852	0.085368	10.3486	0.435744	8.873136	0.270307	10.09264	1.148629
2011	15.47327	0.064747	10.43627	0.087667	9.154684	0.281548	10.11807	0.025437
2012	15.517	0.043733	10.62187	0.185602	9.256137	0.101453	10.39633	0.278256

Source: Planning Commission, MHRD, GOI.

Appendix 4: Unit root test for GDP including intercept al level

time variable: year, 1990 to 2012

dfuller lngdp, regress lags(0)

Dickey-Fuller test for unit root Number of obs = 22

----- Interpolated Dickey-Fuller -----

	Interpolated Dickey-Fuller			
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	1.985	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.9987

D.lngdp	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----					
lngdp					
L1.l	.018909	.0095252	1.99	0.061	-.0009602 .0387781
_cons	-.2147337	.14035	-1.53	0.142	-.5074986 .0780313

Appendix 5: Unit root test for GDP including trend and intercept al level
dfuller lngdp, trend regress lags(0)

Dickey-Fuller test for unit root Number of obs = 22

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-2.337	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.4137

D.lngdp	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----					
lngdp					
L1.	-.2284536	.0977632	-2.34	0.031	-.4330743 -.0238328
_trend	.0163844	.0064513	2.54	0.020	.0028817 .029887
_cons	3.240171	1.366031	2.37	0.028	.3810361 6.099306

Appendix 6: Unit root test for GDP without trend and intercept al level

dfuller lngdp, noconstant regress lags(0)

Dickey-Fuller test for unit root Number of obs = 22

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	15.553	-2.660	-1.950	-1.600

D.lngdp	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----					
lngdp					
L1.	.0043415	.0002791	15.55	0.000	.0037609 .004922

Appendix 7: Unit root test for Elementary Education Expenditure including intercept al level

dfuller lnelem, regress lags(1)

Augmented Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-2.224	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.1975

D.lnelem	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----					
lnelem					
L1.	-.668848	.3006986	-2.22	0.039	-1.300592 -.0371036
LD.	-.2750355	.2227792	-1.23	0.233	-.7430772 .1930061
_cons	6.739233	2.989313	2.25	0.037	.4589194 13.01955

Appendix8: Unit root test for Elementary Education Expenditure including trend and intercept al level

dfuller lnelem, trend regress lags(1)

Augmented Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
	Test	1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(t)	-2.649	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.2578

D.lnelem		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----						
lnelem						
L1.		-.9338358	.3525002	-2.65	0.017	-1.677546 -.1901253
LD.		-.1388194	.2396017	-0.58	0.570	-.6443347 .366696
_trend		.0501419	.0368484	1.36	0.191	-.0276015 .1278853
_cons		8.766123	3.278868	2.67	0.016	1.848316 15.68393

Appendix9: Unit root test for Elementary Education Expenditure without trend and intercept al level

dfuller lnelem, noconstant regress lags(1)

Augmented Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
	Test	1% Critical	5% Critical	10% Critical
	Statistic	Value	Value	Value
Z(t)	0.363	-2.660	-1.950	-1.600

D.lnelem		Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
-----+-----						
lnelem						
L1.		.0076805	.0211306	0.36	0.720	-.0365464 .0519075
LD.		-.6072436	.1841597	-3.30	0.004	-.9926944 -.2217929

Appendix10: Unit root test for Secondary Education Expenditure with intercept al level
dfuller Insec, regress lags(3)

Augmented Dickey-Fuller test for unit root Number of obs = 19

----- Interpolated Dickey-Fuller -----				
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-1.911	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.3271

D.Insec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
Insec						
L1.	-.4256084	.2227677	-1.91	0.077	-.9033976	.0521808
LD.	.2077555	.2631136	0.79	0.443	-.3565671	.7720781
L2D.	.2164383	.2637591	0.82	0.426	-.3492688	.7821453
L3D.	.1904234	.2639846	0.72	0.483	-.3757674	.7566141
_cons	3.878863	2.034417	1.91	0.077	-.4845262	8.242253

Appendix11: Unit root test for Secondary Education Expenditure with trend and intercept al level
dfuller Insec, trend regress lags(3)

Augmented Dickey-Fuller test for unit root Number of obs = 19

----- Interpolated Dickey-Fuller -----				
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-2.255	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.4588

D.Insec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
Insec						
L1.	-.5953465	.263965	-2.26	0.042	-1.165608	-.0250848
LD.	.2939906	.2702083	1.09	0.296	-.289759	.8777402
L2D.	.284246	.2669232	1.06	0.306	-.2924064	.8608985
L3D.	.2391203	.2640451	0.91	0.382	-.3313146	.8095551
_trend	-.043242	.03716	-1.16	0.265	-.1235212	.0370372
_cons	5.985362	2.704372	2.21	0.045	.1429216	11.827

Appendix 12: unit root test for Secondary Education Expenditure without trend and intercept at level
. dfuller Insec, noconstant regress lags(3)

Augmented Dickey-Fuller test for unit root Number of obs = 19

----- Interpolated Dickey-Fuller -----				
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-0.117	-2.660	-1.950	-1.600

D.Insec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
Insec						
L1.	-.0023693	.0202467	-0.12	0.908	-.0455241	.0407855
LD.	-.0051194	.2583315	-0.02	0.984	-.5557399	.5455011
L2D.	.003221	.2590131	0.01	0.990	-.5488524	.5552945
L3D.	-.021703	.2595723	-0.08	0.934	-.5749683	.5315624

Appendix 13: unit root test for University Education Expenditure with intercept at level
dfuller lnuniv, regress lags(3)

Augmented Dickey-Fuller test for unit root Number of obs = 19

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-2.519	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.1109

D.lnuniv	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
lnuniv						
L1.	-.6573892	.2609635	-2.52	0.025	-1.2171	-.0976782
LD.	.4210296	.2618722	1.61	0.130	-.1406305	.9826897
L2D.	.4348482	.2709935	1.60	0.131	-.1463752	1.016072
L3D.	.4072647	.284139	1.43	0.174	-.2021528	1.016682
_cons	5.931384	2.325831	2.55	0.023	.9429719	10.9198

Appendix 14: unit root test for University Education Expenditure with trend and intercept at level
dfuller lnuniv, trend regress lags(3)

Augmented Dickey-Fuller test for unit root Number of obs = 19

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-2.440	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.3584

D.lnuniv	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
lnuniv						
L1.	-.6535612	.2678238	-2.44	0.030	-1.232159	-.0749631
LD.	.4059542	.2700667	1.50	0.157	-.1774894	.9893979
L2D.	.4178158	.279751	1.49	0.159	-.1865495	1.022181
L3D.	.4180811	.2921755	1.43	0.176	-.2131256	1.049288
_trend.	.0129305	.0235686	0.55	0.593	-.0379865	.0638475
_cons	5.731208	2.413897	2.37	0.034	.5162996	10.94612

Appendix 15: unit root test for University Education Expenditure without trend and intercept at level

dfuller lnuniv, noconstant regress lags(3)

Augmented Dickey-Fuller test for unit root Number of obs = 19

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	0.429	-2.660	-1.950	-1.600

D.lnuniv	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
lnuniv						
L1.	.0071372	.0166206	0.43	0.674	-.0282889	.0425632
LD.	.0707686	.260679	0.27	0.790	-.4848557	.6263928
L2D.	.0467431	.2621534	0.18	0.861	-.5120237	.6055099
L3D.	.0569794	.290807	0.20	0.847	-.5628611	.6768198

Appendix 16: unit root test for GDP with intercept at level I

dfuller d1lngdp, regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-3.806	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0028

D.d1lngdp	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
d1lngdp						
L1.	-.6969093	.183094	-3.81	0.001	-1.08013	-.3136891
_cons	.0465152	.0123749	3.76	0.001	.0206143	.0724162

Appendix 17: unit root test for GDP with trend and intercept at level I

dfuller d1lngdp, trend regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-3.409	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.0502

D.d1lngdp	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
d1lngdp						
L1.	-.7774831	.228072	-3.41	0.003	-1.256645	-.2983217
_trend	.0004484	.0007331	0.61	0.548	-.0010917	.0019885
_cons	.0467979	.0125924	3.72	0.002	.0203423	.0732535

Appendix 18: unit root test for GDP without trend and intercept at level I

.dfuller d1lngdp, noconstant regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-0.558	-2.660	-1.950	-1.600

D.d1lngdp	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
d1lngdp						
L1.	-.0378409	.0678584	-0.56	0.583	-.1793911	.1037094

Appendix 19: unit root test for Elementary Education Expenditure with intercept at level I

. dfuller d1lnelem, regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	

Z(t)	-8.781	-3.750	-3.000	-2.630
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MacKinnon approximate p-value for Z(t) = 0.0000

D.d1lnelem	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
d1lnelem						
L1.	-1.604771	.1827589	-8.78	0.000	-1.98729	-1.222252
_cons	.1035918	.2094495	0.49	0.627	-.334791	.5419746

Appendix 20: unit root test for Elementary Education Expenditure with trend and intercept at level I

dfuller d1lnelem, trend regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	

Z(t)	-8.550	-4.380	-3.600	-3.240
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MacKinnon approximate p-value for Z(t) = 0.0000

D.d1lnelem	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
-----+-----						
d1lnelem						
L1.	-1.605192	.1877491	-8.55	0.000	-1.999639	-1.210746
_trend	-.0037861	.0354802	-0.11	0.916	-.0783272	.070755
_cons	.1452653	.4458601	0.33	0.748	-.7914519	1.081982

Appendix 21: unit root test for Elementary Education Expenditure without trend and intercept at level I

dfuller d1lnelem, noconstant regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	

Z(t)	-8.937	-2.660	-1.950	-1.600
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D.d1lnelem	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
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-----+-----						
d1lnelem						
L1.	-1.599803	.1790034	-8.94	0.000	-1.973197	-1.226408

Appendix 22: unit root test for Secondary Education Expenditure with intercept at level I
dfuller d1Insec, regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-4.377	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0003

D.d1Insec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
d1Insec					
L1.	-1.003495	.2292616	-4.38	0.000	-1.483345 -.5236446
_cons	.0165829	.1566239	0.11	0.917	-.3112346 .3444004

Appendix 23: unit root test for Secondary Education Expenditure with trend and intercept at level I
dfuller d1Insec, trend regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-4.259	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.0036

D.d1Insec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
d1Insec					
L1.	-1.003591	.2356507	-4.26	0.000	-1.498674 -.5085068
_trend	-.0003574	.0265758	-0.01	0.989	-.0561911 .0554763
_cons	.020516	.3338161	0.06	0.952	-.6808056 .7218377

Appendix 24: unit root test for Secondary Education Expenditure without trend and intercept at level I
dfuller d1Insec, noconstant regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-4.488	-2.660	-1.950	-1.600

D.d1Insec	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
d1Insec					
L1.	-1.00281	.2234335	-4.49	0.000	-1.468884 -.5367357

Appendix 25: unit root test for University Education Expenditure with intercept at level I
dfuller d1lnuniv, regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-4.029	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.0013

D.d1lnuniv	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
d1lnuniv					
L1.	-.9244716	.2294295	-4.03	0.001	-1.404673 -.4442703
_cons	.0890048	.1238024	0.72	0.481	-.1701166 .3481263

Appendix 26: unit root test for University Education Expenditure with trend and intercept at level I
dfuller d1lnuniv, trend regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-3.974	-4.380	-3.600	-3.240

MacKinnon approximate p-value for Z(t) = 0.0096

D.d1lnuniv	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
d1lnuniv					
L1.	-.9343788	.2351221	-3.97	0.001	-1.428352 -.4404057
_trend	.0099406	.020676	0.48	0.636	-.0334981 .0533793
_cons	-.0194758	.258621	-0.08	0.941	-.5628184 .5238668

Appendix 26: unit root test for University Education Expenditure without trend and intercept at level I
dfuller d1lnuniv, noconstant regress lags(0)

Dickey-Fuller test for unit root Number of obs = 21

----- Interpolated Dickey-Fuller -----				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-4.014	-2.660	-1.950	-1.600

D.d1lnuniv | Coef. Std. Err. t P>|t| [95% Conf. Interval]

d1lnuniv					
L1.	-.8977609	.2236498	-4.01	0.001	-1.364286 -.4312355

Appendix 27: Lag selection Test

Endogenous: d1lmgdp d1lnelem d1lnsec d1lnuniv

Exogenous: _cons

. varsoc gdp elem sec univ, maxlag(8)

Selection-order criteria

Sample: 1998 - 2012 Number of obs = 15

llag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-703.227				1.1e+36	94.2969	94.2949	94.4857
1	-643.672	119.11	16	0.000	3.5e+33	88.4895	88.4795	89.4336
2	-597.815	91.713	16	0.000	1.2e+32	84.5087	84.4906	86.208
3			16		-1454.92*			
4	1102.53		16			-139.004	-139.034	-136.171
5	1118.96	32.858*	16	0.008		-141.194*	-141.224*	-138.362*
6	1097.75	-42.419	16			-138.366	-138.396	-135.534
7	1079.17	-37.147	16			-135.89	-135.92	-133.058
8	1038.22	-81.917	16			-130.429	-130.459	-127.597

Endogenous: gdp elem sec univ

Exogenous: _cons

Appendix 28: Johansen co-integration Test

. vecrank gdp elem sec univ, trend(constant) lags(1) max

Johansen tests for co-integration

Trend: constant Number of obs = 22

Sample: 1991 - 2012 Lags = 1

5%					
rank	parms	LL	eigenvalue	trace statistic	critical value
0	4	-976.80386		74.1301	47.21
1	11	-952.4869	0.89037	25.4961*	29.68
2	16	-942.10719	0.61078	4.7367	15.41
3	19	-939.79808	0.18935	0.1185	3.76
4	20	-939.73883	0.00537		

5%					
rank	parms	LL	eigenvalue	max statistic	critical value
0	4	-976.80386		48.6339	27.07
1	11	-952.4869	0.89037	20.7594	20.97
2	16	-942.10719	0.61078	4.6182	14.07
3	19	-939.79808	0.18935	0.1185	3.76
4	20	-939.73883	0.00537		

Appendix 29: VECM Test

tsset year, yearly

time variable: year, 1990 to 2012

. vec d1lngdp d1lnelem d1lnsec d1lnuniv, trend(constant)

Vector error-correction model

Sample: 1993 - 2012

No. of obs = 20

AIC = .8810517

Log likelihood = 18.18948

HQIC = 1.143461

Det(Sigma_ml) = 1.91e-06

SBIC = 2.22529

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_d1lngdp	6	.017205	0.4488	11.40097	0.0767
D_d1lnelem	6	1.29889	0.7324	38.31702	0.0000
D_d1lnsec	6	.880515	0.4474	11.33438	0.0786
D_d1lnuniv	6	.734932	0.3154	6.449716	0.3747

Equation	Parms	RMSE	R-sq	chi2	P>chi2
D_d1lngdp	6	.017205	0.4488	11.40097	0.0767
D_d1lnelem	6	1.29889	0.7324	38.31702	0.0000
D_d1lnsec	6	.880515	0.4474	11.33438	0.0786
D_d1lnuniv	6	.734932	0.3154	6.449716	0.3747

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
-----+-----						
D_d1lngdp						
_cel						
L1.	-.5565844	.2326914	-2.39	0.017	-1.012651	-.1005176
d1lngdp						
LD.	-.1245576	.2044853	-0.61	0.542	-.5253415	.2762263
d1lnelem						
LD.	.0017405	.0030504	0.57	0.568	-.0042381	.0077191
d1lnsec						
LD.	.0198925	.0124908	1.59	0.111	-.0045891	.044374
d1lnuniv						
LD.	-.0063761	.0121901	-0.52	0.601	-.0302682	.0175161
_cons	-.0002175	.0038861	-0.06	0.955	-.0078342	.0073992
-----+-----						
D_d1lnelem						
_cel						
L1.	-29.23421	17.56753	-1.66	0.096	-63.66593	5.197514
d1lngdp						
LD.	7.742793	15.43805	0.50	0.616	-22.51524	38.00082
d1lnelem						
LD.	-.2475618	.230294	-1.07	0.282	-.6989297	.2038061
d1lnsec						
LD.	.3139956	.9430201	0.33	0.739	-1.53429	2.162281
d1lnuniv						
LD.	-.7791531	.9203178	-0.85	0.397	-2.582943	1.024637
_cons	-.0182867	.2933924	-0.06	0.950	-.5933253	.556752
-----+-----						
D_d1lnsec						
_cel						
L1.	-19.28884	11.90897	-1.62	0.105	-42.62999	4.052314
d1lngdp						

```

      LD. | -10.05053  10.46541  -0.96  0.337  -30.56235  10.46129
      |
d1lnelem |
      LD. | .2476779  .1561155   1.59  0.113  -.0583029  .5536587
      |
d1lnsec |
      LD. | .1187496  .6392702   0.19  0.853  -1.134197  1.371696
      |
d1lnuniv |
      LD. | -.2189288  .6238804  -0.35  0.726  -1.441712  1.003854
      |
      _cons | .0234182  .1988898   0.12  0.906  -.3663986  .413235
-----+-----
D_d1lnuniv |
      _ce1 |
      L1. | -10.12761  9.939954  -1.02  0.308  -29.60956  9.354339
      |
d1lngdp |
      LD. | -2.245902  8.735067  -0.26  0.797  -19.36632  14.87451
      |
d1lnelem |
      LD. | .1222118  .1303036   0.94  0.348  -.1331784  .3776021
d1lnsec |
      LD. | .5290185  .533574   0.99  0.321  -.5167673  1.574804
d1lnuniv |
      LD. | -.8706925  .5207287  -1.67  0.095  -1.891302  .1499171
      |
      _cons | .0081961  .1660055   0.05  0.961  -.3171688  .333561
-----+-----
Cointegrating equations
Equation      Parms  chi2  P>chi2
-----+-----
      _ce1           3  51.13192  0.0000
-----+-----
Identification: beta is exactly identified
                Johansen normalization restriction imposed
-----+-----
      beta |   Coef.  Std. Err.   z  P>|z|  [95% Conf. Interval]
-----+-----
      _ce1 |
d1lngdp |           1           .           .           .           .
d1lnelem | .0238374  .0053399   4.46  0.000   .0133713  .0343035
d1lnsec | .0694181  .0174206   3.98  0.000   .0352743  .1035619
d1lnuniv | -.0619093  .0213966  -2.89  0.004  -.1038459  -.0199727
      _cons | -.0640999           .           .           .           .
-----+-----

```

Appendix 30: LM Test

```
. veclmar
```

Lagrange-multiplier test

```

+-----+
| lag |   chi2  df  Prob > chi2 |
+-----+
| 1 | 11.9235  16  0.74923 |
| 2 | 10.3985  16  0.84501 |
+-----+
H0: no autocorrelation at lag order

```

Appendix 31: Jarque-Bera Test

vecnorm, jbera skewness kurtosis

Jarque-Bera test

+-----+				
	Equation	chi2	df	Prob > chi2
+-----+				
	D_d1lngdp	1.098	2	0.57757
	D_d1lnelem	1.562	2	0.45784
	D_d1lnsec	4.797	2	0.09085
	D_d1lnuniv	0.317	2	0.85337
	ALL	7.774	8	0.45580
+-----+				